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CONTENTS

ANNUAL A.O.A. CONGRESS ISSUE

ORIGINAL PAPERS
A Critical Study of Visual Screening. *Vernon Ryan* 227
Orthoptics in Myasthenia—Two Case Reports. *Otto J. Bebber* 258
Correlation of Speed and Distance Judgment with Visual Acuity. *John R. Oliver and A. R. Lauer* 263
ANNOUNCEMENT
Summer Post-Graduate Courses for Optometrists 262
EDITORIAL
Accomplishments and Problems at A.O.A. Congress. *Carel C. Koch* 266
CURRENT COMMENTS
Miami Beach in June *Terry Judith Parkins* 268
TRANSACTIONS OF THE ACADEMY
New Members 276
BOOK REVIEWS
Visual Skills by B. E. Kehl. *Paul Slaton* 277
SPECIAL REPORT
Scleral Tonometry for Optometry. *Henry L. Wolfe* 278-282

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44 . . . . 18, 20, 22
46 . . . . 20, 22

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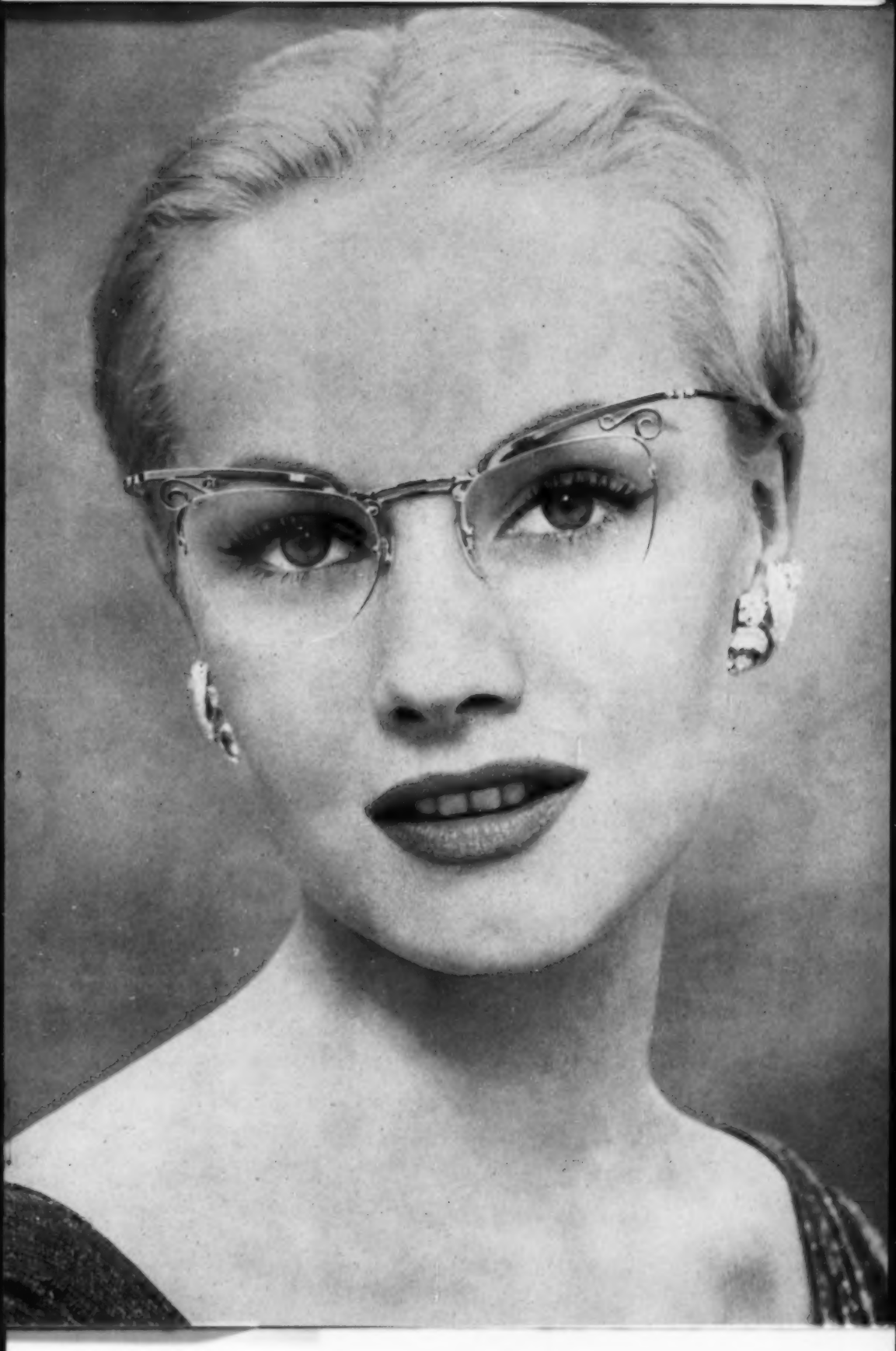

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SECOND PORTION SPRING SCHEDULE

STATE & CITY	DATE	TIME	TYPE COURSE	HOTEL
Kentucky:				
Louisville	Sun., April 15	1:00 p.m. to 5:00 p.m.	A & B	Henry Clay
Tennessee:				
Nashville	Sun., April 15	1:00 p.m. to 5:00 p.m.	A & B	Dinkler-Andrew Jacks
Knoxville	Mon., April 16	7:00 p.m. to 10:00 p.m.	A	Andrew Jackson Hotel
Chattanooga	Mon., April 16	7:00 p.m. to 10:00 p.m.	A	Hotel Patten
Georgia:				
Atlanta	Tue., April 17	7:00 p.m. to 10:00 p.m.	A & B	The Dinkler Plaza
North Carolina:				
Charlotte	Wed., April 18	7:00 p.m. to 10:00 p.m.	A	Hotel Charlotte
South Carolina:				
Columbia	Wed., April 18	7:00 p.m. to 10:00 p.m.	A	Hotel Columbia
Charleston	Wed., April 18	7:00 p.m. to 10:00 p.m.	A	Fort Sumter Hotel
West Virginia:				
Charleston	Fri., April 20	7:00 p.m. to 10:00 p.m.	A & B	The Daniel Boone
Ohio:				
Cincinnati	Sun., April 22	1:00 p.m. to 5:00 p.m.	A & B	Netherland Plaza
Columbus	Sun., April 22	1:00 p.m. to 5:00 p.m.	A & B	Deshler Hilton Hotel
Cleveland	Fri., April 27	7:00 p.m. to 10:00 p.m.	A & B	Hotel Statler
Akron	Fri., April 27	7:00 p.m. to 10:00 p.m.	A & B	Portage Hotel
Toledo	Wed., May 17	7:00 p.m. to 10:00 p.m.	A & B	Commodore Perry Ho
Pennsylvania:				
Pittsburgh	Wed., April 25	7:00 p.m. to 10:00 p.m.	A & B	Hotel William Penn
Philadelphia	Wed., June 6	7:00 p.m. to 10:00 p.m.	A & B	Adelphia Hotel
Michigan:				
Detroit	Sun., May 20	1:00 p.m. to 5:00 p.m.	A & B	Hotel Statler
New York:				
Buffalo	Tue., May 22	7:00 p.m. to 10:00 p.m.	A & B	Hotel Statler
Syracuse	Wed., May 23	7:00 p.m. to 10:00 p.m.	A & B	Hotel Syracuse
Rochester	Thur., May 24	7:00 p.m. to 10:00 p.m.	A & B	The Sheraton Hotel
New York	Thur., June 7	1:00 p.m. to 5:00 p.m.	A & B	Hotel Roosevelt
Maryland:				
Baltimore	Sun., June 3	1:00 p.m. to 5:00 p.m.	A & B	Lord Baltimore Hotel
District of Columbia:				
Washington	Sun., June 3	1:00 p.m. to 5:00 p.m.	A & B	Hotel Statler
Virginia:				
Richmond	Mon., June 4	7:00 p.m. to 10:00 p.m.	A & B	Hotel John Marshall
Norfolk	Mon., June 4	7:00 p.m. to 10:00 p.m.	A & B	Commodore Moury H
New Jersey:				
Newark	Thur., June 7	1:00 p.m. to 5:00 p.m.	A & B	The Douglas Hotel
Connecticut:				
Hartford	Sun., June 10	7:00 p.m. to 10:00 p.m.	A & B	Hotel Statler
Massachusetts:				
Boston	Sun., June 10	7:00 p.m. to 10:00 p.m.	A & B	Hotel Statler

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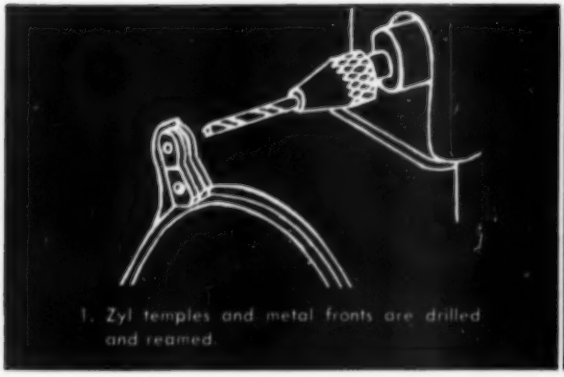

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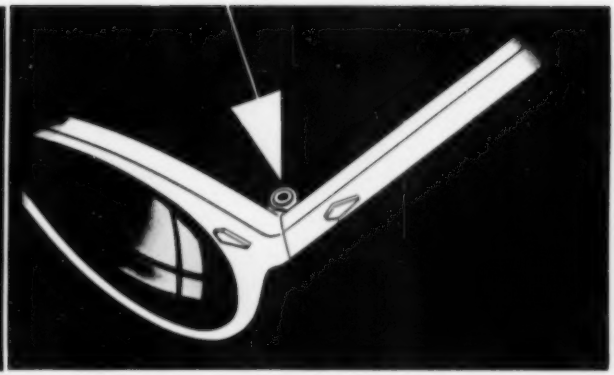
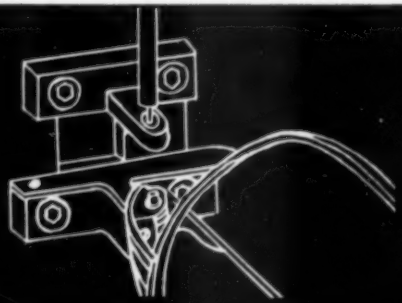


Hinge Tightness



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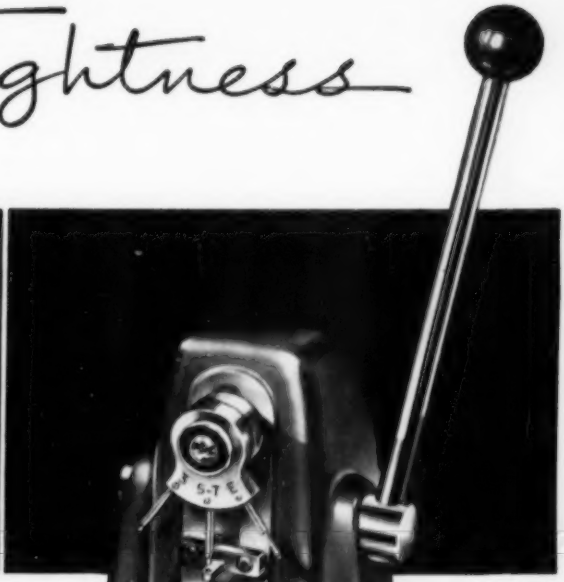

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AMERICAN JOURNAL OF OPTOMETRY
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Vol. 33 May, 1956 No. 5

A CRITICAL STUDY OF VISUAL SCREENING*

Vernon Ryan†
Pennsylvania State College of Optometry
Philadelphia, Pennsylvania

The requirements of a good screening program are two fold, namely, efficiency and practicality. The efficiency of a given program will determine the percentage of referrals (refers) and non-referrals (non-refers) properly made for given referral standards. A one-hundred per cent efficiency would imply that the program had yielded no under-referrals and no over-referrals—an ideal toward which we should strive continually. In the screening of school children, *over-referrals*, i.e., those cases unnecessarily referred for further examination, are the cause of unnecessary expense and inconvenience to parents and school authorities and may offer a hindrance to those children who are in immediate need of special examination and eye care. However, *under-referrals*, i.e., those cases needing comprehensive ocular examination which escape detection by the examiner, provide a more serious problem. Good vision screening should aim at overlooking not even one person in need of a full eye examination, even though the effort to attain such an objective may necessitate a considerable number of over-referrals. The practicality of a screening program is of major importance. Good vision screening must not consume too much time, nor cost too much money, if it is to be practical. Hence, the cost of equipment, the requirements of personnel for the administration of tests and the interpretation of results, and the time factor involved in carrying the project through to completion, must all be considered.

The decisions regarding the use of equipment and the choice of tests will be determined largely by the purpose of the screening program.

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*Read before the annual meeting of the American Academy of Optometry, Chicago, Illinois, December 11, 1955. For publication in the May, 1956, issue of the AMERICAN JOURNAL OF OPTOMETRY AND ARCHIVES OF AMERICAN ACADEMY OF OPTOMETRY.

†Optometrist. Member of faculty. F.S.M.C. (London).

For example, in the case of school children, color vision tests may be omitted because a child's achievement in school is not appreciably affected by a deficiency in color discrimination.

This paper will review the means at our disposal for the mass screening of school children, with special attention to the results obtained in a number of screening projects of an experimental nature which have been carried out for the purpose of assessing the practicality and relative efficiencies of the methods used. In the discussion of these experimental projects, an attempt will be made to draw some inferences as to the best course to follow in future vision screening programs.

There are five vision screening procedures which have been widely used in the schools of the United States. These five procedures are listed in Table I, together with the visual tests which can be performed in each. The first three of these procedures make use respectively of the three well known commercial instruments, the Ortho-Rater, the Sight-Screener, and the Telebinocular. The Massachusetts Vision Test (M.V.T.) employs a series of clinical tests and does not necessarily require the use of any commercial screening device. The last procedure listed utilizes the Snellen chart as a simple screening device. Table I shows up the Snellen chart for exactly what it is, namely, a device for testing the acuity of vision at distance and nothing more. The other four procedures all make provision for the measurement of both lateral and vertical heterophorias at distance in addition to acuity of vision. These procedures will all reveal substandard vision arising from uncorrected myopia and absolute hyperopia as well as defective vision due to astigmatism and amblyopia. However, the Massachusetts Vision Test (M.V.T.) is the only screening procedure considered here which makes specific provision for the detection of uncorrected hyperopia by means of a plus spherical lens.

It is not true to say that the three commercial test batteries ignore the possibility of the presence of facultative hyperopia, i.e. that hyperopia which a subject can overcome by means of accommodation in order to maintain clear vision. The visual skills are to some extent inter-dependent. The clear-sighted hyperope may pass the visual acuity tests, but the defect (facultative hyperopia) may cause the subject to fail the phoria test, show difficulty with the fusion test or lower stereopsis.

For the same reason of inter-dependence of the visual skills it may be said that some tests are hardly necessary, particularly the one for simultaneous vision. All three test batteries when used to demonstrate stereopsis at the same time confirm the presence of simultaneous vision and fusion. It can of course be said that the instrument which

TABLE I

TESTS PROVIDED FOR BY SOME VISION SCREENING INSTRUMENTS AND PROCEDURES

	ORTHO-RATER	SIGHT SCREENER	TELE-BINOCULAR	M. V. T. (ORIGINAL)	SNELLEN CHART
			DISTANCE		
Visual Acuity O.D., O.S., O.U.	• • •	• • •	• •	• • •	• •
Lateral Phoria or Tropia	•	•	•	•	
Vertical Phoria	•	•	•	•	
Hyperopia (Plus lens test)				• • •	
Simultaneous Vision		•	•		
Fusion			•		
Stereopsis	•	•	•		
Color Perception	•		•		
			NEAR		
Visual Acuity O.D., O.S., O.U.	• • •	• • •	• • •		
Lateral Phoria	•	•	•	•	
Vertical Phoria	•	•			
Simultaneous Vision		•			
Fusion			•		
Stereopsis		•			
Color Perception		•			

makes provision for more specific tests can be used to reveal more specific weaknesses. It is all a question as to just how analytical it is necessary to be, particularly in a school vision screening procedure. The Sight-Screener and Telebinocular in providing the test for simultaneous vision do make it possible to reveal individuals who have a tendency for suppression. The Telebinocular provides a specific test for fusion for both distance and near, for it is frequently found that a fusion difficulty exists at one or both distances.

The three commercial test batteries repeat the visual acuity tests at near, as well as the lateral phoria test. The M.V.T. (Massachusetts Vision Test) and the Telebinocular test for vertical imbalance only at distance, because it is a rare occurrence for a child to have a marked vertical heterophoria at near without exhibiting the same at distance. The Ortho-Rater and Telebinocular provide a test for color perception at distance. The Sight-Screener is accompanied by a binder of pseude-isochromatic plates for use in testing color perception at the near distance.

Any procedure of three parts providing for (1) Acuity of vision tests at distance, (2) A plus lens test for hyperopia, (3) Phoria tests at distance and near, is basically a Massachusetts Vision Test. As already

stated no particular commercial instrument is essential for the carrying out of an M.V.T. procedure, but undoubtedly the Welch-Allyn test kit, and the new American Optical School Vision Screening Test are very convenient methods of using the procedure.

The original "Massachusetts Vision Test" was manufactured by the Welch-Allyn Company to specifications set by the Massachusetts Department of Public Health. The portable test kit is taken apart into floor unit and table unit. The floor unit when set up presents two Snellen acuity charts side by side. Above the charts can be seen the outline of a house with a window. In the center of the window a spotlight can be presented. The floor unit is connected electrically to a table unit by means of which the examiner controls the illumination of the charts and window light 20 feet away. Stored in the table unit are the accessories, viz., occluders, plus sphere spectacles, and two pairs of Maddox rod spectacles one having the ribs horizontal and the other having the ribs vertical. The table unit has provision for making the lateral phoria test at 16 inches.

The child to be screened sits near the table close to the examiner who when administering the tests must hold an occluder before both left eye and right eye in turn for both Part 1 and Part. 2. Also for Part 2 the examiner puts on the subject the plus sphere spectacles. Although the original M.V.T. required Parts 1 and 2 to include tests made for right eye, left eye, and both eyes, it is usual now to test only monocularly and omit the binocular tests. For Part 3 of the test the child must be fitted first with one pair of Maddox rod spectacles and then with the other pair. If the vertical phoria test precedes the lateral test then the examiner may proceed to the near lateral phoria test without again having to change the Maddox rod glasses.

Any child who wears glasses is screened with the glasses in use. It is sometimes difficult to fit the test spectacle required in Parts 2 and 3 over the glasses being worn by the subject. Occasionally it is almost impossible to so place the Maddox rod spectacles that the streak of light is seen exactly vertical or horizontal as the case may be. A child is very likely to comment if the streak of light is even slightly oblique. In that respect children are no different from adults. Nevertheless the procedure is a good one. Each test is performed at the critical point for passing or failing, and this not only simplifies matters but saves much time. The house and window are of such dimensions that any child with an excessive lateral phoria sees the streak of light outside the house, while if an excessive vertical phoria is present the horizontal streak produced by the vertical ribs will be seen above or below the window.

The American Optical Company version of the M.V.T. employs a floor unit basically like the Welch-Allyn original. The table unit however is quite different and embodies the occluders and optical test elements in a self-supported headpiece. The examiner simply dials each successive test and thereby saves time while not having the annoyance of constantly putting on and off the various spectacles which each child would otherwise have to wear. The use of such a headpiece rather than several pairs of spectacles has much to commend it in respect of hygienic considerations.

RELIABILITY OF VISUAL ACUITY TESTS

Gordon, Zeidner, et al,[1] carried out two parallel sets of acuity tests, one using the Ortho-Rater and one with visual acuity wall charts. They found the Ortho-Rater to be more reliable than the wall charts, even though these charts were carefully and adequately illuminated. Similar studies, on a more extensive scale, were made by Sulzman, Cook and Bartlett.[2,3] These workers developed a modification of the Snellen chart, called the New London chart, to serve as a reasonable standard for the measurement of visual acuity. The visual acuity findings obtained with the use of the New London chart were compared with those obtained with commercial instruments. Sulzman, Cook and Bartlett concluded that the type of Telebinocular then available (1947-8) was not as reliable as the Ortho-Rater and the Sight-Screener, but that there was little difference between the Ortho-Rater and the Sight-Screener as regards validity and reliability, both instruments being as reliable as the Snellen chart but slightly inferior to the New London chart. Morgan, Crawford, et al,[4] have computed the coefficients of correlation between the results obtained in a study of visual acuity measurements on school children in Toronto by the use of the Snellen letter chart as compared to the results obtained by various other methods. Their results are given in Table II.

It is thought that these coefficients give undue weight to the discrepancies between the tests in the region of poor visual acuities. This is tantamount to believing that in the region of better visual acuities, i.e., near the critical point of passing or failing a vision screening test of acuity, better correlation can be expected when using the commercial instruments.

It should be remembered that the Telebinocular offers a test for "usable vision" as distinct from monocular acuity with one eye occluded. It is easy to show on the Telebinocular that in many instances superior visual acuity can be achieved with each eye by occluding the other. The binocular tests offered by the Telebinocular are valued by users because

TABLE II

VISUAL ACUITY TEST INTERCORRELATIONS

Grades 3-8. Toronto.
(From Morgan, Crawford, Pashby and Gaby)

Test or Instrument Used	Correlation with Snellen Letter Test
Snellen Number	0.94
Project-O Number	0.94
Project-O Letter	0.96
Telebinocular	0.75
Sight-Screener	0.83
Ortho-Rater	0.67

usable vision is measured with both eyes open as is true when we work, read, or play. Thus to correlate usable vision measurements of the Telebinocular with the monocular acuity findings using the Snellen letter chart may be interesting but hardly justifiable. The Ortho-Rater and Sight-Screener also measure monocular vision with both eyes in use. The Telebinocular in use at the time when Sulzman, Cook and Bartlett made their investigations was a model which had the far-point setting made at optical infinity. The more recent instruments have the far-point setting made for clinical infinity (twenty feet) thus coming into line with the practices of the ophthalmic professions.

INFLUENCES OF ILLUMINATION

In the reports studied, no significant changes in visual acuity were found when the illumination of the Snellen chart was varied between 5, 10, and 15 foot candles.

DEPENDENCE OF RESULTS UPON TRAINING OF THE EXAMINER

A. E. Sloane[5] carried on an extensive experimental program on the screening of school children using the Massachusetts Vision Test and the Snellen chart. While tabulating the visual acuity data of the Snellen test obtained by teachers and the staff ophthalmologist on the same pupils, he observed that the two sets of data showed agreement in 387 cases and disagreement in 119 cases (23.5% of the total). It has been suggested that one cause for this discrepancy lies in the degree of skill and care exercised by the examiner. This opinion is supported by the results obtained by a trained technician whose data compared more favorably with that of the ophthalmologist than did the general average, showing disagreement in only 10% of the cases. In addition to factors involving training, other factors such as those concerned with the personal equation of the examiner should have an influence on the results of any program. It is reasonable to suppose that between examiners possessing equal training, and for the same examiner at different times,

there would occur some discrepancies concerning even such a simple procedure as the taking of the visual acuity. As Scobee[6] has put it in his report on the St. Louis study, "Even the most skilled examiner may occasionally require a second or even a third test to determine whether the visual acuity is actually 'normal.' "

EFFICIENCY OF SCREENING PROCEDURES

The only way to pass judgment on the efficiency of a screening procedure is to make use of it on a large group of people and then to give every member of the group a full eye examination in addition to the screening test. Those individuals who are found by means of the full eye examination to require glasses, a change of glasses, or orthoptic treatment, are those who should have been referred as a result of the screening procedure and are the proved correct "referrals." By noting the number of actual referrals found not to require present eye care, the examiner can see just how many "over-referrals" have resulted from the screening procedure. All members of the group found on complete eye examination to be in need of present eye care but not so revealed by the screening procedure are to be properly regarded as "under-referrals."

In the past 15 years, a number of attempts have been made to test the efficiency of various screening procedures in the schools of the United States. We shall attempt to evaluate here five of these studies as examples of such attempts. Our first two examples will consist of studies in which the entire populations were given full eye examinations in addition to the screening tests. The other three examples are studies in which only the referred subjects were given clinical examination thus checking on correctness of referral and determining the number of over-referrals, but of course giving no indication of the under-referrals. Thus the second group of studies are such as determine the qualitative nature of the procedures that are used, while those in the first group also show the degree of success in detecting all those who need a full eye examination. Some results from all five of these vision screening surveys are here collated, but the figures should not be scrutinized too narrowly because of the presence of so many variables with respect to age groups, social environments, economic backgrounds, etc., of the children who were screened. The work of Morgan, Crawford, and others at Toronto has already been referred to, (Table II), and other references will be made to the same study.

THE ST. LOUIS STUDY

In 1948-49, a mass screening project of school children was carried out in St. Louis by Crane, Scobee, Foote and Green.[7] Here, various screening procedures were used on a group of 1,215 pupils, 606 of whom

were in the first grade, and 609 in the sixth grade. Subsequently, all members of the group were given full eye examination by a team of three ophthalmologists. In this way, using the decision of the eye doctors as the criterion, the results of the screening procedures were analyzed in terms of correct referrals, incorrect, under-referrals and true non-referrals. The results are shown in Table III.

TABLE III

ST. LOUIS SCREENING TESTS

PERCENTAGE OF PUPILS CORRECTLY AND INCORRECTLY REFERRED BY VARIOUS SCREENING PROCEDURES

Type of Test	Person Performing Test	Percentage of Sixth Grade Pupils Referred		Percentage of First Grade Pupils Referred	
		Correctly	Incorrectly	Correctly	Incorrectly
Clinical Examination	Ophthalmologist	31	—	23	—
Ortho-Rater	Nurse	25	32	*	*
	Technician	24	29	*	*
Sight-Screener	Nurse	23	31	*	*
	Technician	24	23	*	*
Telebinocular (Mfr's St'd)	Nurse	23	38	20	51
	Technician	24	33	18	29
Telebinocular (Study St'd)	Nurse	24	33	17	37
	Technician	23	27	15	18
Snellen (High St'd) + Judgment + Near Vision (High St'd)	Teacher & Nurse	23	28	18	35
Snellen (High St'd) + Judgment	Teacher	21	24	16	25
Massachusetts Vision Test	Nurse	18	12	15	16
	Technician	20	11	15	16
Snellen (High St'd) + Near Vision (High St'd)	Teacher & Nurse	20	15	16	24
	Technician	18	8	14	13
Snellen (High St'd) + Near Vision (Low St'd)	Teacher & Nurse	17	7	15	11
	Technician	14	3	11	7
Snellen (High St'd)	Nurse	14	6	12	8
	Technician	14	2	11	7
	Teacher	15	6	13	9
Judgment	Teacher	13	19	10	19
Near Vision (High St'd)	Nurse	13	11	13	20
	Technician	11	7	12	8
Snellen (Low St'd)	Nurse	6	1	5	0
	Technician	7	1	4	1
	Teacher	8	2	4	1
Near Vision (Low St'd)	Nurse	7	2	6	4
	Technician	5	1	4	1

*Test not administered to first grade.

DISCUSSION OF ST. LOUIS RESULTS

Several writers have already made reference to the evidence provided in Table III, namely, that in the St. Louis study the commercial instruments seem to have yielded both the highest percentage of correctly referred sixth grade pupils and also the highest percentage of incorrectly referred sixth grade pupils. In the case of first grade pupils, the Telebinocular scored an even greater success with respect to correct referrals, and an even worse failure with respect to over-referrals, the percentage sent unnecessarily for a full eye examination being very much higher than the percentage benefitting from such an examination.

What deserves special emphasis here is the fact that in the St. Louis study, if we consider the screening procedure which proved most successful in detecting those children who needed to be referred for further eye examination, even that particular procedure was able to disclose only 80% of those in actual need of eye care. Thus, the Ortho-Rater, which heads the list in performance with respect to the screening instruments used, correctly referred only 25 per cent of the group out of a possible 31 per cent, as revealed by clinical examination. Therefore, the Ortho-Rater method failed to disclose almost 20 per cent of the possible number of correct referrals. Examination of Table III will show that the percentage of correct referrals becomes progressively smaller with each succeeding method, indicating that under-referrals are on the increase.

The Snellen High Standard Test used as a simple procedure rates poorly in this study, being able to discover at best less than half of those in need of eye care. It seems obvious from the results of this study that much has yet to be done if we are to find a practical and yet nearly ideal screening procedure. What is interesting about Table III is the favorable comparison possible between teacher judgment and the Snellen High Standard Test. On the basis of this comparison, it would seem justifiable to ask those States which use only the Snellen chart for visual screening of their school children to dispense with their equipment and just "ask the teacher," to achieve the same degree of success they now enjoy. It will be seen from Table III that teacher judgment alone in the St. Louis study detected 42% of those in need of the full examination, a result which is almost as good as that obtained by the use of such equipment as the Snellen chart. Seriously, the St. Louis study does show that the Snellen test alone and teacher judgment alone, both show a high percentage of over-referrals and under-referrals and appear to be very inadequate as individual screening procedures. A different result is obtained, however, when teacher judgment is combined with the Snellen High Standard Test and the near vision tests.

Here, the percentage of correct referrals equals that obtained with the Sight-Screener and the Telebinocular and is only one or two per cent lower than that obtained with the Ortho-Rater, while the percentage of incorrect referrals is less than that for the commercial instruments. This is very significant. It indicates clearly the value of the near vision test as well as the value of teacher judgment. The teacher whose judgment was used as a criterion for referral in the St. Louis study had previously been given a briefing by a doctor concerning signs and symptoms of eye strain. The four doctors who conducted this study took the view that teacher judgment contributes but little to the accuracy of the final results and accounts for a large percentage of over-referrals. The statement regarding over-referrals is true enough, but the same thing is true of commercial instruments, one of which according to Table III shows an even higher percentage of over-referrals than does teacher judgment. It would seem that the combination of visual acuity tests plus teacher judgment is only a little less efficient than the commercial instruments with respect to percentage of correct referrals.

The Massachusetts Vision Test does not seem to be greatly inferior to any of the screening methods listed above it in Table III. At the same time, it shows up very creditably with respect to over-referrals. In quoting percentages, care must be taken to distinguish between those which refer to the entire group screened and those which are based only on the number of subjects referred. Thus, in the St. Louis study, the M.V.T. screened out 20 per cent of the sixth grade pupils correctly when administered by a technician, as compared to a possible 31 per cent as shown by clinical examination. It should be noted that the M.V.T. correctly referred close to 64 per cent of all those whom it did refer. Thus, the M.V.T. reveals itself qualitatively as being better than any procedure shown above it in Table III.

The Snellen High Standard Test is seen to rate lower than the M.V.T., a fact which is to be expected since the M.V.T. consists of the Snellen test plus other tests.

Later information[8] does show that when the results for judgment are combined with those obtained with the M.V.T., the percentage of correct referrals is increased from the 20 per cent quoted above to 23 per cent, which achievement is only a little less successful than that of the Ortho-Rater (25 per cent).

Teacher judgment can be supplemented with a brief history-taking just prior to the screening procedure. It does not require much time to ask two or three pertinent questions regarding eye-strain and eye comfort, but such questioning has been found to be very unreliable with children of the lower grades.

CORRELATION COEFFICIENTS OF THE ST. LOUIS STUDY

In the foregoing comments on the results recorded at St. Louis, emphasis is placed on the relative success of the various procedures in finding the needed referrals, i.e., those who were in real need of a complete ocular examination. Statistically, however, and of course practically, the success in finding the needed referrals must be weighed against the burden of over-referrals, otherwise the obvious thing to do is to refer the entire group.

In the booklet entitled "Screening School Children for Visual Defects,"[8] a table is given showing the "point" correlation coefficients for the various procedures given in Table III above. These correlations take into account both categories of each of the two variables, viz., the refers and the non-refers of the reference criterion (i.e., the clinical examination), and the refers and the non-refers of the procedures. The term "point" correlation implies that every pupil given the screening procedure is simply passed or failed with no provision made for scores that could possibly reveal an underlying normal distribution. The method of computing "point" correlations as given in the booklet is relatively easy to follow. It involves the use of "two-by-two" scatters. Below, in Table IV, are given some of the published results, ranked here in accordance with the average point correlation coefficient.

A glance at the above table will impress one with the fact that none of the correlations are really high while some are very low. With the exception of "Judgment" it is to be noted that Table IV tends to reverse the rank order of Table III, that is, the procedures most efficient in the sense of correlation with the criterion tend to be least successful in finding the needed referrals. Thus the Snellen high standard test procedure which has the highest correlation coefficient resulted in the finding of less than half of the possible correct referrals, (about 15 per cent of the population as compared to the 31 per cent indicated by clinical examination).

The M.V.T. is an exception, ranking second in correlation efficiency and showing fair success in respect of percentage correct referrals, about two-thirds of those possible being detected.

The Snellen low standard procedure which correlates better than any of the commercial test batteries failed in finding less than one-quarter of the needed referrals.

It seems that in choosing a vision screening procedure one has to make a choice between "success" and "efficiency" or maybe one has to balance the one against the other. It is a mistake to be too impressed by the fact that a procedure has one of the highest correlation coefficients

TABLE IV

POINT CORRELATION COEFFICIENTS
ST. LOUIS STUDY 6th GRADE

TYPE OF TEST	EXAMINER	CORRELATION COEFFICIENT	AVERAGE
Snellen High St'd	Technician	.52	
	Nurse	.44	.466
	Teacher	.44	
Massachusetts	Technician	.48	.45
Vision Test	Nurse	.42	
Snellen High St'd &	Technician	.49	.45
Near Vision High St'd	Nurse and Teacher	.41	
Snellen Low St'd	Technician	.38	
	Teacher	.37	.366
	Nurse	.35	
Ortho-Rater	Nurse	.33	.325
	Technician	.32	
Sight-Screener	Technician	.40	.325
	Nurse	.25	
Judgment and the	Teacher and Nurse	.32	.315
Massachusetts Test	Teacher and Technician	.31	
Telebinocular	Technician	.33	.305
Study Standard	Nurse	.28	
Judgment and	Teacher	.29	.29
Snellen High St'd			
Telebinocular	Technician	.27	.23
Mfr's Standard	Nurse	.19	
Judgment	Teacher	.14	.14

without consideration as to how well it does the job of finding those who need to be found. Obviously some school authorities have been influenced in the choice of a procedure by the correlation coefficient.

The St. Louis study shows the M.V.T. as a fairly good procedure. It ranks second in the correlation table along with the Snellen high standard and near vision high standard combination, and it also shows a near two-thirds success in the percentage table. It is very likely possible to so improve the M.V.T. procedure that it can be able to have greater success without loss of present efficiency. Other studies are reported in the following pages to support this view.

SOME FACTS CONCERNING THE COMMERCIAL SCREENING INSTRUMENTS

At the time of the St. Louis study the manufacturers of the Ortho-Rater and the Sight-Screener had made no recommendations as to the standards for referral that should be used. It was therefore necessary to establish the "study standards" at St. Louis as a basis for referral when using the instruments. The Telebinocular was also tried out with the

use of the study standard in addition to the standards recommended in the 1947 manual of instructions.

More recently, the Bausch & Lomb Co. have derived their own standards for use with the Ortho-Rater. The new standards were set up on a statistical basis and fail the poorest ten to fifteen per cent on each skill: they were presented at the meeting of the Academy in Toronto in 1954. Bausch & Lomb have informed me that during the past year they have processed records on 39,919 children, the rate of referral averaging slightly over 17 per cent. It is not known of course what rate of over-referral is included in the 17 per cent, but this is vastly different to the case at St. Louis where the over-referrals alone total about 30 per cent of the population. However one wonders how the proportions of correct and incorrect referrals are distributed within the current referral rate of 17 per cent. I have compared the new standards with those used at St. Louis and have not noticed any great difference. This is not to say that there is no significant improvement now possible in performance. The new standards are more liberal in regard to acuity, and exophoria at near, but the cutoff point for phorias at distance, and for esophoria at near are rather lower than those used at St. Louis. While the new standards will undoubtedly result in fewer referrals, it is difficult to believe that they will largely eliminate over-referrals.

Anyone who has compared the Keystone Record Form #3, 1947, as used with the Telebinocular at St. Louis, with Record Form #3, 1955, will have noticed striking differences. The "expecteds" have been sufficiently broadened to make a high over-referral rate seemingly impossible if the procedure is used in accordance with the manual of instructions. It is unfortunate that the present standards for referral were not ready in time for use at St. Louis, but it should be remembered that the scores were doubly evaluated, once in accordance with the 1947 expecteds, and again in accordance with study standards which are in fact more in line with the 1955 official standards. Even using the study standards at St. Louis, a high over-referral rate resulted, but the most important of the instructions given by the Keystone View Company was not observed, namely that failures should be rechecked before referral, and moreover by someone highly skilled in the administration of the tests. There is little doubt that if the present day instructions are meticulously observed, the over-referral rate by the Telebinocular can be very much better than that which resulted from its use at St. Louis.

The Sight-Screener was designed especially for use in Industrial vision testing programs rather than for use in screening school children.

Nevertheless the degree of success in finding the needed referrals at St. Louis was remarkably good. By devising more suitable cutoff scores it should be possible, as with the other instruments, to much improve the ratio of correct to incorrect referrals, while still achieving a high degree of success in respect of the correct referrals. It is interesting to note, however, that American Optical Company has designed a new School Vision Screening Test based upon the Massachusetts Vision Test. By the use of this instrument the M.V.T. can be administered more conveniently and more hygienically than by the use of accessory spectacles. The experimental model was used in the Danbury Study referred to later in these pages.

THE COLUMBUS STUDY

A valuable study of the comparative efficiencies of various screening procedures was carried out at The Ohio State University under the supervision of Thomas E. Shaffer.[9] This study was a cooperative undertaking engaged in by members of the staffs of the College of Medicine, the College of Education and the School of Optometry. The survey (1947), carried on at Columbus was similar to the St. Louis study, in which as many as possible of the entire group of school children subjected to the screening tests were also given careful refractions. By this procedure, it was possible for the investigating team to ascertain the number of correct referrals in a large group of children. In the Columbus study, 203 children of grades one to eleven were given a variety of screening tests and then 188 of these children were given complete refractions. As in the St. Louis study, the various screening procedures were compared with one another with respect to percentage of referrals. The screening procedures used were four in number, namely, the Telebinocular, the Snellen chart, the M.V.T., and teacher referral. The criterion for passing in the visual acuity tests was fixed at better than 20/40 in each eye for children up to seven years of age and better than 20/30 in each eye for children over seven years of age. The percentages given in Table V below are computed on the basis of information published by Shaffer in 1948.

Of the 188 cases completely analyzed, 88 per cent were children over seven years of age who were required to exceed a visual acuity of only 20/30 for passing. The lack of agreement between the results of the M.V.T. and the Snellen "E" test in the Columbus study leads one to suspect that the standard of acuity in these tests is altogether too low. A slightly higher standard, viz., better than 20/25 for passing, (i.e., 20/20-3), might yield more consistent results. Otherwise, it is difficult to understand why in this study the M.V.T. as a whole detected

TABLE V

THE COLUMBUS STUDY

PERCENTAGE OF REFERRALS
(After Shaffer, et al.)

TEST USED	CORRECT REFERRALS	UNDER-REFERRALS	OVER-REFERRALS
Clinical Examination	32.4%	%	%
Telebinocular	28.7	3.7	36.2
Snellen Test	27.0	5.4	14.9
Massachusetts Vision Test	21.2	11.2	1.06
Teacher Referral	16.5	15.9	22 (Approx.)

fewer cases of refractive error than did the Snellen "E" test alone. Since the Snellen test is an integral part of the M.V.T., it is far from logical that the Snellen test utilized as Part 1 of the M.V.T. should prove inferior to the same test when administered under its own name, or that the use of a complete test should produce fewer referrals than the use of only a part of that test. Shaffer claims that more exacting standards for passing would eliminate anomalous results of this sort.

According to Shaffer,[9] "The Snellen test for visual acuity at 20 feet is the most reliable of screening procedures when carried out carefully and with proper illumination." Sloane had arrived at a similar conclusion eight or nine years earlier when doing the original experimental work with the M.V.T. On the other hand, the St. Louis study revealed less than half the possible number of correct referrals by the use of the Snellen "E" test (High Standard) as compared to over 80 per cent by the use of commercial screening devices. No matter how reliable the Snellen "E" test may be as a single procedure (and the St. Louis study casts a doubt upon its reliability), the preference for this test, as opposed to other procedures which use it along with additional tests, is open to question. Since the M.V.T. incorporates the Snellen test into its procedures, it is obvious that the use of the M.V.T. should produce better results than the use of the Snellen test alone.

Shaffer mentions the fact that some modifications of the plus sphere test and the heterophoria test are to be suggested in a later report. Sloane,[5] in developing the M.V.T. in 1938-39, made it quite clear that the plus 1.50 sphere was only a "happy medium" and that possibly a stronger sphere should be used for younger children and a weaker one for older children. In regard to heterophorias, the Columbus study shows that the M.V.T. rarely causes a child to be referred unnecessarily, but that it does miss the referral of some who it is designed to detect. However, the Telebinocular in the same study was found to cause the

referral of a great many children needlessly, but rarely to miss significant ones. It was also found that the use of the Telebinocular produces slightly better results than the Snellen test alone, although the Snellen test as already stated yields the best results of any single test employed.

THE SHREWSBURY STUDY

Yasuna and Green[10] carried out a screening program on 1,575 school children, grades one to twelve, at Shrewsbury, Massachusetts. These investigators used the original Massachusetts Vision Test and referred a total of 307 children. This test is made up of three parts. In Part 1, the test demands a high standard Snellen acuity, 20/20-2 being required for a child to be marked "passed" and 20/20-3 being sufficient for a child to be marked "failed," and accordingly listed for referral. In Part 2 of this test, use is made of a plus 1.50 diopter sphere and in Part 3 use is made of the Maddox rod (phoria test). Of the 307 children who were marked for referral, 43 per cent failed Part 1 (Snellen test), 48 per cent failed Part 2 (plus sphere test), and nine per cent failed Part 3 (phoria test). Notices were sent to the parents of all the 307 referred children advising them that complete clinical ocular examinations were necessary. The results showed approximately 37 per cent over-referrals. However, since none of the children who passed the screening procedure was given a full examination, the study does not reveal the number of under-referrals. As far as they go, the results shown in Table VI, relative to the children referred, are quite interesting.

In screening the younger children, ages six to eight, the experimenters lowered the passing value of the Snellen Standard Test to 20/30, which is considered a normal visual acuity for children of that age group. It was noted that most of the children requiring glasses were in the higher age groups, 9 to 11 and 12 to 18. Of all the children in the six to eight age group who had passed Parts 1 and 2 of the M.V.T. and failed Part 3, not one was found to require glasses. About 63 per cent of the total number of referred children were given prescriptions for glasses. Most of the children who required prescriptions were in the higher age groups, so that for the older children the number of referrals requiring glasses was very close to 70 per cent. We may safely conclude in the case of the older children that about two-thirds of the referrals were correct and about one-third were incorrect. This proportion is in close accord with that found in the St. Louis study. Yasuna and Green[10] conclude that the M.V.T. has been found practical and valuable in the mass screening of school children. They recommend that the phoria

test (Part 3) be omitted as unreliable. It would probably be wise, however, to retain this test when school children in grades three and above are screened, since the results in Table VI show that 50 per cent of the children referred on the basis of the phoria test were found to require glasses.

TABLE VI

THE SHREWSBURY STUDY

RESULTS OF CLINICAL EXAMINATION OF SCHOOL CHILDREN REFERRED BY THE M.V.T. (After Yasuna and Green)

Category of Refers (Part of M.V.T. Failed)	Percentage Distribution of Refers	Percentage of Each Category of Refers Given Glasses
Part 1	43	81
Part 2	48	50
Part 3	9	50

THE ANDOVER STUDY

The original Massachusetts Vision Test was developed by Sloane[5] in 1938-39. Later, Sloane and Gallagher[11] modified the M.V.T. to yield additional information. This work was first reported by these men in 1944. As in the usual procedure, the visual acuity at distance was taken for each subject, both monocularly and binocularly. Then, for those who wore glasses, the visual acuities were taken both with and without the prescribed glasses in place. Muscle balances were measured for each subject, both for distance and for near. A prismometric scale was employed in the muscle balance test instead of the "house and window" device originally used by Sloane. By this means, quantitative information relative to the degree of muscle balance was obtained instead of the purely qualitative criteria of "failed" and "passed." In this study, 797 adolescent students between the ages of 12 and 19, attending a boys' preparatory school, were screened by a team of technicians. In addition to the vision tests, the boys were given a general physical examination by the school physicians who asked questions relating to the eyes, to vision and to symptoms of eye strain. Any student whose responses suggested the possibility of visual difficulties was referred for a complete eye examination, even though he had successfully passed all parts of the screening procedure. This modified M.V.T. indicated referral for 116 students, or 14.5% of the total group screened. However, only 41 of these referred subjects cooperated sufficiently to take the complete clinical examination. Of these 41 who

were given a full test, only 36 were found to be in actual need of eye care. It can be deduced from these figures that for the sample taken, 88 per cent of the referred students were referred correctly. Bearing in mind the normal sampling error, we may state that for the population screened the percentage of correct referrals equals 88 per cent of 14.5%, or a total of 12.8 per cent. Table IX, which compares the efficiency of the M.V.T. as used in five different studies, makes references to the Andover study as yielding 12.8 per cent of correct referrals as computed above.

It should be mentioned that 14 students in the Andover study, in addition to the 116 above, were listed for referral as a result of the questioning procedure. These students disclosed typical symptoms of visual difficulties in spite of their having passed the M.V.T. Sloane and Gallagher found that nine of these 14 students did, in fact, need eye care, but that the other five students were to be regarded as over-referrals. This ratio of nine correct referrals to five incorrect ones does not seem to be too satisfactory when viewed in the cold light of statistics. In analyzing their data, Sloane and Gallagher[11] came to the conclusion that "referral on the basis of symptoms alone is often unnecessary." However, with respect to the nine who did receive eye care as a result of questioning, who can say how great the benefit may have been for these few? Who can say how significant a difference has been wrought in the lives and futures of these young students as a result of this extra eye care?

Table VII gives the results of clinical examination of 55 students, 41 of whom were referred directly by the M.V.T. and the other 14 as the result of questioning.

In case this work at Andover be subjected to criticism on the grounds that too small a group is considered and that too few of the students have been clinically examined, it must be pointed out that the work is being continued. In 1952, Sloane and Gallagher[12] published a later report on further findings as a continuation of the earlier study. This report deals with results obtained on a group of 185 boys examined clinically, 124 of whom had failed the modified M.V.T. and 61 of whom had passed the test but at some later time (within nine months) had complained of symptoms suggesting visual problems. The report gives detailed comparisons between screening tests data and that obtained by clinical examination. Under-referrals among the group at large were not specifically looked for, since it is assumed that any significant cases missed by the screening procedure are those who in later months complained of symptoms and were thus discovered.

TABLE VII

THE ANDOVER STUDY

RESULTS OF CLINICAL EXAMINATION OF REFERRED CASES

(After Sloane and Gallagher)

Number Who Failed Part 1 of M.V.T. (Visual Acuity Test)		19
Number of These Who Failed Clinical Examination	19	
Number Who Failed Part 2 of M.V.T. (Plus Sphere Test) After Passing Part 1		14
Number of These Who Also Failed Clinical Examination	14	
Number of Asymptomatic Over-Referrals Included in the Above	3	
Number Who Failed Part 3 of M.V.T. (Heterophoria Test) After Passing Parts 1 and 2		8
Number of These Who Also Failed Clinical Examination	8	
Number of Asymptomatic Over-Referrals Included in the Above	2	
Number of Referrals on Basis of Symptoms Alone		14
Number of These Found to Require Treatment (i.e., Correct Referrals)	9	
Number of Over-Referrals on Basis of Symptoms Alone	5	

Of the 124 adolescents referred by use of the modified M.V.T. in the later Andover study, only one was found to have been referred unnecessarily. Qualitatively, then, with respect to referrals, the procedure appears to be almost ideal, being better than 99 per cent correct. Sloane and Gallagher[12] emphasize the fact that a procedure is to be judged on its ability to select referrals on a qualitative rather than on a quantitative basis. This is, of course, true providing that the procedure is at least fairly good quantitatively.

Of the 61 students in this later study at Andover who were referred some time after the screening procedure because of symptoms, 13 were found by clinical examination to be in need of eye care and are therefore proved to have been in the category of under-referrals. There may have been others who could have benefitted by eye care and who were also missed by the screening procedure. All in all, however, the modified M.V.T. appears to have been highly successful, especially in conjunction with the system of regular physical examinations which afforded an opportunity to note symptoms that suggested the need of an eye examination.

It should be mentioned that the students at Andover are a highly select group, so that it would be unreasonable to expect such highly favorable results from the same vision screening procedure in an average grade school.

THE DANBURY STUDY

In 1952-53 the Research Department of the American Optical Company initiated a School Vision Health Study in Danbury, Con-

necticut. A total of 4,662 children were screened by means of the Massachusetts Vision Test. Those who failed the test were retested to provide a second opportunity to meet the test standards.

In the other screening studies already dealt with in this article, those who failed the screening test were clinically examined by the same eye doctor or small group of eye doctors upon whose decision depended the correctness or incorrectness of referrals. Thus the validity of the criterion for correctness of referral is open to question. At Danbury the procedure which was followed was one which conforms to everyday practice. Upon receipt of a referral notice the parent was perfectly free to consult an optometrist or ophthalmologist in the Danbury area or elsewhere. In this way the criterion for correctness of referral was the rank and file vision practitioner.

The eye doctor performing a clinical examination was requested to complete a report form prepared by the Bureau of Visual Science, and to return it to the school department in the prepaid addressed envelope provided. By this means it was possible to study the results of clinical examination and arrive at some indication concerning the qualitative effectiveness of the screening procedure.

In the Danbury study an important innovation is to be noted in the manner of handling those who failed the screening tests. Thus, if a child was wearing glasses, and failed both test and retest, a recommendation to have a re-examination was not sent to the parent until the school health department had been advised of its desirability by the eye doctor who last examined the child. The diplomatic manner in which this was done is described in the report by Hollis M. Leverett.[13] Not all those who failed the screening tests were therefore clinically examined, and it is convenient here only to consider the qualitative accuracy for the group which did not have glasses.

4,087 children did not have glasses, and of these nearly 12 per cent failed both the test and retest. Referral forms were mailed for 501 children, and in due course 51.7 per cent of the reports were returned by the eye doctors. From these reports it was possible to ascertain that 73.2 per cent of the referrals were found to need visual care. On this basis the computed percentage of correct referrals for the children not having glasses is about 8.8 and the over-referrals amount to about 3.2 per cent. Thus the M.V.T. is shown by this study to be qualitatively very good.

No attempt was made to estimate the percentage of correct referrals for the entire group, because those children wearing glasses who failed the tests were handled differently to the others who failed. The study

does show a very much higher referral rate for those having glasses, (45 per cent failed both test and retest). The study also shows that that if all the children wearing glasses who failed both test and retest had been referred, a very high over-referral rate would have resulted for this section of the population. It was the anticipation of such a probability that lead to the special treatment of those who were wearing glasses, thus avoiding many unnecessary referrals and enhancing the general effectiveness of the whole project.

DISCUSSION

We may ask ourselves this question, "How many children are in need of eye care?" By the expression, "In need of eye care," we refer to those children who need it *now*, at this moment, children who will not normally get visual attention without the intervention of someone in authority. Some children in present need of eye care will get the required attention in the very near future because their parents are aware of the need and are sufficiently concerned about it not to delay the matter. However, such cases are very much in the minority. There are many other children in great number who need eye care *now*, but whose parents are unaware of the need. In some cases these children are wearing glasses which need changing, while in other cases where glasses or orthoptic treatment or other attention is urgently required, nothing at all is being done because neither children nor parents are aware of the situation.

Children who have glasses should be told to wear them during the screening procedure. A note should be made as to when the glasses were obtained. At the same time, the examiner should ask questions concerning clearness of vision, symptoms of eye strain, etc. For the lower grades, teacher judgment is preferable to questioning. It is generally agreed that asking young children specific questions regarding symptoms is unwise. Children are far too much open to suggestion and too willing and anxious to please the examiner. Scobee[6] estimated that out of ten children with normal vision who answer affirmatively regarding subjective complaints usually associated with eye strain, only about three will be in actual need of eye care. Scobee also observed that a child who complains voluntarily of a headache usually has a rather easily discoverable cause for it, while one who answers direct questions regarding headaches rarely supplies any reliable information.

Table VIII collates the percentages of *possible* correct referral on the basis of results obtained by clinical examination in three cities. The referral rates at St. Louis and Columbus contrast sharply with that

which was found at Toronto. The vision tests that were carried out at Toronto were mainly for the pupose of deriving test intercorrelations, some of which are given in these pages. The entire group was refracted, and "referral" is on that basis only. Had an ideal screening procedure been used on the Toronto group then 7 per cent would have been referred in exact accordance with clinical decisions. The group included kindergarten and lower grades thus partly explaining the unusually low percentage referral.

TABLE VIII

POSSIBLE CORRECT REFERRALS AS DETECTED BY CLINICAL EXAMINATION OF ENTIRE GROUPS

STUDY	SUBJECTS TESTED	PERCENTAGE OF POSSIBLE CORRECT REFERRALS
St. Louis	Grades 1 and 6	26 *
Columbus	Grades 1 through 11	32.4
Toronto	Kindergarten and Grades 1 through 8	7

* The 26 per cent given for St. Louis is computed directly on the basis of 316 referrals from the population of 1,215. The average of 27 per cent that can be arrived at by considering figures given separately for grades 1 and 6 (Table III) is not accurate.

If we take into account the many variables which may determine the percentage of children needing eye care in a particular group, then it can be realized that to average the results in the few surveys given above in Table VIII is quite unjustifiable. Many estimates of the total number of children in the United States needing eye care have been made, and such estimates are usually far from well founded. It would necessitate many well planned studies such as the above in order to arrive at a reasonably accurate estimate.

Much interest has been shown in the Massachusetts Vision Test, and for this reason it is thought of value to collate results obtained by that procedure in five different surveys. Table IX presents data from the surveys made at Andover, Columbus, St. Louis, Shrewsbury, and Danbury. In three of these studies, namely Andover, Shrewsbury and Danbury, those who passed the screening tests were not given a clinical examination, and so these studies tell nothing about under-referrals.

To summarize the performance of the M.V.T. as shown in the above five studies, it may be said that the screening procedure detects about two-thirds of the needed referrals and over-refers a little more than one-third the number correctly referred. However, many more such studies would be necessary before a reasonably accurate evaluation of the M.V.T. could be made. Certainly it is already evident that the M.V.T. is qualitatively very good and quantitatively fair. It may

TABLE IX

REFERRALS OBTAINED IN THE MASSACHUSETTS VISION TEST

(All Percentages Based on Entire Group Screened)

STUDY	SUBJECTS TESTED	PERCENTAGE OF REFERRALS		
		Correct Referrals	Under-Referrals	Over-Referrals
Andover (1940)	Adolescents (Computed on basis of clin. exam. given to sample of the referred group	12.8	*	1.7
Columbus (1947)	Grades 1 through 11	21.2	11.2	1.06
St. Louis (1947-48)	Grades 1 and 6 (Averages for Nurse and Technician)	17.0	10.0	13.75
Schrewsbury (1949-50)	Grades 1 - 12. (Clin. exam. given to sample referreds)	12.3	*	7.2
Danbury (1952-53)	K. and 1 - 12 none of whom were wearing glasses†	8.8	*	3.2

* The studies were not intended to yield data concerning under-referrals.

† Those wearing glasses who failed both test and retest were not recommended to have a professional examination without prior consent of the eye doctor who last examined the child.

be safely assumed that most of the children needing eye care are detected by the procedure, and that the "missed," i.e., the under-referrals, are mainly those children with less severe anomalies.

THE CONTROVERSIAL HETEROPHORIA TEST

Considerable difference of opinion exists among authorities regarding the wisdom of including heterophoria tests in vision screening programs. A number of questions have been asked, such as the following: "Of what significance is muscle imbalance as a vision defect in itself or as an indication of the presence of an associated refractive error?" "How reliable are heterophoria tests in themselves and how do the results obtained by various methods compare with each other other?" "Does a muscle balance test justify itself as a basis for referral?" These questions and many more like them have led to the present lack of unanimity. It is certainly irritating to the eye doctor to have a child referred back to him a few weeks or months after glasses have been prescribed simply because that perfectly happy child shows evidence of heterophoria. Heterophoria tests measure only demands upon the postural mechanism of the eyes. Therefore, when the reserves available to cope with those demands are not taken into account, it is obvious that the use of heterophoria tests in vision screening programs will result in many unnecessary referrals.

Heterophoria tests are undoubtedly of value in locating the presence of a refractive error, especially hyperopia. But if a plus lens is used specifically to screen out hyperopes, as in the M.V.T., then additional tests for hyperopia may become superfluous. We must remember

that not only is the significance of the presence of heterophoria in doubt, and the necessity of using it as a clue to hyperopia open to question in view of the availability of the direct plus sphere test, but that the heterophoria test itself is known by every practitioner to have poor reliability. The value of heterophoria tests is diminished by the fact that ocular muscle balance can show a moment by moment variation and the degree of muscle balance can often be subject to control by the patient. Also, test results are markedly influenced by test conditions. Therefore, it is not surprising that the use of different methods for measuring heterophoria on the same patient will often lead to quite different results.

Morgan, *et al*,[4] studied the vision of a large number of public school children in the city of Toronto. These investigators made muscle balanace measurements repeatedly on the same children with the use of different instruments. They then computed the correlations of the results from one instrument with those from each of the other instruments. These correlations are presented in Table X.

The correlation coefficients in these tests are all quite low. It is obvious that the standard for passing the heterophoria test must be set according to the instrument used, if reasonable criteria are to be established.

Yasuna and Green[10] recommend the elimination of Part 3 (phoria test) of the M.V.T. Possibly, a safer alternative would be the deletion of Part 3 for all children up to and including the second grade. In the Shrewsbury study, Yasuna and Green prescribed for seven of the fourteen children who failed the heterophoria test, but noted that not one of these seven were in the six to eight age group. Shaffer,[9] in his study on children of grades one to eleven, found that 7.4 per cent of the entire group had been correctly referred on the basis of muscle imbalance. Such a percentage, representing 14 out of a total of 61 referrals, appears sizeable enough to warrant a continuation of the use of heterophoria tests. Sloane and Gallagher,[13] in studying a group of adolescent students of ages 12 to 19 years, found only two asymptomatic subjects on subsequent clinical examination among eight students referred on the basis of muscle imbalance. These observations seem to justify the use of heterophoria tests in the screening of older children and adolescents.

TABLE X

INTERCORRELATIONS OF MUSCLE BALANCE TESTS

Grades 3-8 Toronto
(From Morgan, Pashby and Gaby)

	Telebinocular	Ortho-Rater	Sight-Screener	Synoptophore
	NEAR TESTS			
Maddox Rod vs	+0.39	+0.53	+0.52	+0.60
Telebinocular vs		+0.46	+0.56	+0.53
Ortho-Rater vs			+0.57	+0.41
Sight-Screener vs				+0.62
	FAR TESTS			
Maddox Rod vs	+0.25	+0.20	+0.27	
Telebinocular vs		+0.36	+0.57	
Ortho-Rater vs			+0.47	

TIME REQUIREMENTS IN VISION SCREENING

Since the amount of time which must be devoted to a vision survey program is of both practical and economic importance, it is necessary to consider the average amount of time per pupil required for the examiner to perform a series of tests and to compare the time needed in one procedure with the time requirements of the other procedures. In the St. Louis study,[7] one examiner averaged 1.7 minutes per seventh grade pupil with the use of the M.V.T. and another examiner averaged 2.6 minutes for the same procedure. This gives a combined average of 2.15 minutes for the use of M.V.T. The use of the Telebinocular, the Sight-Screener and the Ortho-Rater for the same subjects required a combined average time of 6.2 minutes per pupil. Thus, it can be seen that the M.V.T. has an advantage of nearly three to one with respect to the time factor. In the Columbus study,[9] it was found by Shaffer that the average time required for administration of the M.V.T. to children of the elementary grades was about 3.5 minutes as compared to about seven minutes with the use of the Telebinocular. In this study the M.V.T. is shown to have an advantage of two to one over the Telebinocular with respect to time consumption. These experiments show that the M.V.T. when properly administered not only offers an efficient vision screening procedure but that it also offers a procedure which possesses an advantage over other methods in its time requirements.

THE NEW ENGLAND REPORT ON THE MASSACHUSETTS VISION TEST

The Winter issue of the SIGHT SAVING REVIEW for 1953 carries a report[14] by a joint committee of several New England Medical groups on the problem of school vision testing. This Committee does not feel that it is good policy for an eye doctor to give vision tests to school children because "A doctor making the test and giving a passing report might give a false sense of security to the individual that all is well."

The committee feels that the eye doctor should be utilized in a school vision program only in an advisory capacity. The above report recognizes the fact that there has been some relaxation with regard to the standards set for passing the acuity tests. The Committee recommends that for children below the fourth grade the required standard be 20/40 with the poorer eye; while for the higher grades the standard be 20/30 with each eye. It is felt by the Committee that these limits are not too severe in view of the fact that the use of well-illuminated charts and trained personnel are recommended.

It should be noted that most of the studies on screening procedures reported in recent years show a high order of under-referrals or leave little doubt that such under-referrals were made. Yet, these studies nearly all use higher standards for passing than those now recommended by the New England Committee. In view of these facts, one cannot help but feel that a relaxation of visual acuity standards will succeed in reducing the number of over-referrals at the expense of increasing the number of under-referrals, a result which is to be deplored. The New England Report recognizes the value of the plus sphere test for hyperopia but recommends that a +2.25 D. lens be used for children below the fourth grade, and that a +1.75 D. lens be used for older children. The latest test kits for the administration of the M.V.T. made by the Welch-Allyn Company are designed so that the above recommendations in respect of visual acuity and plus lenses may be applied.

The American Optical School Vision Test reverts to the high standard of Snellen acuity formerly used by Sloane when developing the M.V.T. The requirement of 20/20 vision for each eye is, I feel, commendable. The "tumbled E" charts provide a 20/30 line of optotypes for use when desired, but there is no 20/40 line, thus requiring a minimum of 20/30 for the lower grades. The optical test units in the headpiece provide +1.75 D. spheres for the testing of kindergarten and first two grades, and +1.50 D. spheres for grades 3 through 12. The Maddox rods are conveniently dialed into position for Part 3 of the procedure. The final near phoria test utilizing the butterfly and its "headlight" requires only a few seconds.

THE COMBINED LATERAL AND VERTICAL HETEROPHORIA TEST

A recent report from Atlantic City by Diskan[15] describes the screening of a large number of school children using a procedure that is a modification of the M.V.T. The procedure employs a visual acuity check, a plus sphere test, and phoria tests at both distance and near. For the phoria test, however, Diskan substitutes a "red dot" test in place

of the Maddox rod test. Thus for Part 3 the subject wears a spectacle frame with a red glass before one eye and a green glass before the other eye. Looking at a rectangle of green light within which there is a red spotlight, the subject sees only the dot of red light with the eye having the red filter and the rectangle of green light with the eye having the green filter. The eyes are thus dissociated and free to assume the phoria position. If either a lateral or a vertical phoria is present of greater limit than that allowed for by the size of the rectangle when viewed at 20 feet, the subject sees the spot of light outside the rectangle and fails the test. A similar phoria device is employed at near. This phoria test has much to commend it, for in addition to possessing simplicity, it achieves a definite saving in time.

Any procedure, however, that utilizes a visual acuity test, a plus sphere test, and a phoria test is basically a Massachusetts Vision Test. It is not desirable that whenever a modification of the M.V.T. be made that the procedure as a whole be named after a town or city, though undoubtedly much can be said to support special naming. Certainly, however, it would be worth while for the manufacturers to consider such modification of the M.V.T. kit that would permit a combination of lateral and vertical phoria tests. Diskan found that the time required to screen school children averaged 70 seconds each for the complete test, and only 50 seconds each when the "red dot" test was used at distance only. The danger in speeding up the procedure to this extent is that it necessarily involves regimentation of the children tested and by the emphasis on speed must cause no small amount of excitement, if not real tension.

CONCLUSIONS AND RECOMMENDATIONS

When properly administered, the Snellen test at distance is undoubtedly the best single test available for vision screening. This opinion is to be expected from the dictates of common sense and in all probability has never been seriously questioned. There could be a no more obvious way of proving an individual's ability to see than by the use of a vision chart. In the same manner, the hearing sense is tested by exposure of the auditory membrane to sound waves of various frequencies, and the sense of smell is tested by contact of the olfactory membrane with primary odors. With respect to vision, however, there *is* more to be considered than merely the achievement of a sharp retinal image, even when there are no physiological or psychological problems involved. For efficient seeing, the optical mechanism must be able to function without undue strain and the postural mechanism must be able to preserve its proper balance. Undue strain on the optical or

postural mechanisms may or may not affect the visual acuity, although such strains must interfere with efficient seeing. Therefore, even in cases of good visual acuity, it is wise to include in the screening procedure some simple tests for both hyperopia and muscle balance.

The literature on vision screening upholds the contention that the M.V.T. is a good screening procedure. This procedure includes tests for visual acuity, uncorrected hyperopia and muscle balance. No special apparatus is required for implementing the M.V.T., although not too expensive commercial devices embodying all the necessary equipment are available. Since all three parts of the M.V.T. are clinical in nature, the individual procedures of this test are best performed by professional ophthalmic practitioners. It should be observed that Part 1 of the M.V.T. is the same as the Snellen "E" test at 20 feet and that the Snellen "E" test has been demonstrated as the best single screening test now available. Therefore it must follow that the M.V.T. cannot be inferior to the Snellen test in detecting the needed referrals, and should be quite superior.

In comparison to the use of the commercial test batteries, the M.V.T. is favored by the time factor as being by far the speediest procedure, and various studies indicate that it is also quantitatively a good procedure while being qualitatively very good.

There appears to be need of another experimental study similar to the one made at St. Louis, making use of the present day cutoff scores recommended by the makers of the commercial test batteries, and involving a re-check of all failures by persons highly skilled in the administration of the tests. Such a study should include the M.V.T. using a high standard visual acuity test rather than the low standard recently recommended by New England committees.

In regular school vision screening programs the use of teacher judgment should supplement the test results, and students in the higher grades should be questioned regarding symptoms associated with eye strain.

No student wearing glasses who fails both test and retest should be referred without prior consent of the eye doctor who last examined the child. In this way it is possible to cut down on the over-referrals, because many in this category continue to have visual handicaps in spite of the very best eye care.

In Part 2 of the M.V.T. the plus sphere most suitable for the higher grades is probably the +1.50 D. lens, while for the lower grades it should be +2.00 D. or +2.25 D. Part 3, the phoria test, should be used for all children grades 3 and above, but omitted for grades 1 and 2.

It does appear to be necessary to re-check all failures before sending out referral notices. A high over-referral rate rapidly brings vision screening programs into disrepute among parents, causing them in many cases to ignore the referral notices, thus resulting in a category that I refer to as "dead-end" referrals. Unfortunately, the procedure of retesting the failures before referral while it will eliminate many over-referrals will also reduce to some extent the number of correct referrals. It is hoped that the sacrifice of a small percentage of what would be correct referrals is justified and that the cases involved are the less significant in the sense of eye care need.

The problem of dead-end referrals may be much more serious than is generally believed, and the whole future of school vision screening depends upon whether or not it can be solved. In Peoria[16] during the fall of 1948 over 12,000 school children were given vision screening tests. It was found that 17.57 per cent were visually below "minimum standard." Notices recommending a professional eye examination were sent to the parents of all children who were below standard. Of 2,226 children in need of eye care only about 460 (20.7 per cent) had received such eye care by August, 1949. Anything worse than this would surely mean that school vision screening is so near to becoming a fiasco that the people of this country should be told the facts, and that they, the people, should demand a better alternative.

The situation in respect to dead-end referrals at Danbury was rather better. There, about 51.7 per cent of referral reports were returned by doctors after clinical examination. This could mean that nearly one-half the referred patients became dead-end referrals. Some of the doctors may have neglected to send in the report form after the giving of an examination, but it is unlikely that there were many such.

An obvious alternative to school vision screening is for the State education departments to be made fully responsible for seeing that every school child has a full clinical eye examination either in the school or outside the school. When we pause to consider all the shortcomings of vision screening, such as the under-referrals, the over-referrals, the dead-end referrals, and the small percentage of correct referrals who ever get to an eye doctor in spite of follow-up precedure, and when we remember the cost of the personnel involved, of the printing, record keeping, and correspondence, all this on an annual basis, then it would surely not be much more costly or less practical to put into effect the alternative of clinical examination on a three or four-year basis.

Another alternative, less socialistic, is for the State legislatures to enact laws requiring certification of vision before the promotion of

children from certain grades such as 1, 5, and 8. Some institutions of higher learning already require such certification prior to admission. It is far from unreasonable therefore for such a requirement to be made at earlier stages in the career of the student when the greater harm can be done both to the eyes and the career by neglect of eye care.

There may be but little hope of realizing such vision care for school children in the near future, but nevertheless, if vision screening cannot be made more effective than it is at present, then the people of this country should be made fully aware of the facts.

Meanwhile, if vision screening must continue in the schools, there is a way, at least in theory, by which more satisfactory screening can be administered, and that is by the use of professional eye men by whose skill and experience the over-referral rate could be still further reduced, while the correct referral rate could be increased. Over-referrals make headline news among parents and are devastating to the effectiveness of the programs. The optometrist or ophthalologist armed with ophthalmoscope and pinhole disc could prevent a great many over-referrals and thus in some degree restore confidence in vision screening. Moreover, the use of professional eye men would eliminate the need for a formal re-testing of all the failures, for the doubtful cases would be skillfully dealt with at one screening examination. Many optometrists believe so strongly in this kind of professional vision screening that they are already going ahead with it on a voluntary basis in so far as the schools will co-operate. The writer feels it his duty to warn ophthalmic practitioners of the dangers to both themselves and the public of this kind of vision care. The dangers, some of which have already been mentioned in the literature on visual screening, are as follows:

1. Vision screening in becoming *diagnostic* defeats its own purpose.

2. Parents would rely unduly upon the results of vision screening, so that the child who passed the screening examination and subsequently developed a visual defect would be less likely to be taken to an eye doctor for an examination.

3. Over-referrals would still result from the screening procedure and reflect badly upon the ophthalmic professions as well as on the school system which up to this time has itself had to accept most of the blame.

4. The eye doctor who performs vision screening is doing the work of a technician.

5. It is extremely doubtful if many eye doctors would be content to accept the monotony of visual screening for more than a very short while.

6. Many ophthalmic practitioners have based their estimates of what they could do in the schools on the assumption that once in the schools on a statutory basis, they will be able to do as they want, whenever they want and how they want. The actuality, if it ever materializes, must necessarily be very different to the assumption.

Finally, the writer would point out that there is a role for professional ophthalmic practitioners to fill in an advisory capacity in connection with school vision screening. However, such a role is rather limited in its scope and it is doubtful if it could ever justify the full time employment of thousands of eye practitioners. Even with the eye doctors acting in an advisory capacity the main problems of vision screening touched upon in this paper still remain to be solved.

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ORTHOPTICS IN MYASTHENIA GRAVIS — TWO CASE REPORTS*

Otto J. Bebber†
Denver, Colorado

Myasthenia gravis is a disease mainly affecting the voluntary muscles, particularly the extraoculars, the facials, the masseters and the muscles concerned with talking and swallowing. In addition, the neck muscles and those moving the arms and legs, particularly at the level of the shoulders and hips, are often involved. In certain instances the respiratory muscles are also affected. Muscular dysfunction due to abnormal fatigability, with recovery after an appropriate interval of rest, is the chief symptom. Ptosis of the eyelids, with weakness of the muscles of facial expression, particularly about the mouth, gives rises to the "myasthic facies."

INCIDENCE.

Prior to 1935 the disease was considered rare; since that date, owing to improved diagnostic tests and an awakened interest, many cases have been reported. Although myasthenia gravis occurs in all age groups, the incidence in adolescence or the third decade of life is the highest; the second largest group occurs between the ages of sixty and seventy. It rarely occurs after seventy or before ten years of age, but cases have been reported in infants. Two members of the same generation may be affected, but a hereditary tendency has not been observed. The incidence of the disease is about equal in the two sexes. Cases have been observed in Negroes and Chinese.

ETIOLOGY.

The cause of myasthenia gravis is not known. There is evidence that the abnormal fatigability of the voluntary muscles is due to an incomplete, or distorted, transmission of the nerve impulse to the muscle across the synapse of the myoneural junction. The disturbance appears to be in the acetylcholine-cholinesterase balance at the synapse, without the principal disease being in either the muscle or the nerve. As some afflicted patients during the last two trimesters of pregnancy show complete remission of their symptoms, the disease is affected by the pregnancy hormones.

SYMPTOMS.

The chief symptom of myasthenia gravis is excessive fatigue of voluntary muscles, with a tendency, as the result of rest or drug treat-

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ment, toward restoration of normal power. The weakness is similar to partial curarization of the muscles. The symptoms tend to group themselves into three general categories based on localization: (1) those associated with the extraocular muscles; (2) with the muscles supplied by the other cranial nerves, particularly the 5th, 7th, 9th and 12th; (3) general muscular weakness, sometimes limited to special muscle groups such as those supplying the neck, the fingers, the shoulders, the hips.

The extraocular muscles may be principally involved. Ptosis, with or without diplopia, is the most common early sign of the disease. Next in frequency is dysphagia, due to weakness of the voluntary muscles that initiate the swallowing reflex plus involvement of the muscles supplied by the 9th cranial nerve, including those over which there is no voluntary control. This muscle group is the exception to the usual location of muscle weakness in voluntary muscles alone. Masseter muscular weakness may be the chief symptom, requiring the patient to hold the jaw shut with his hand. General muscular weakness is about as common as dysphagia. Inability to hold up the head and difficulty in crossing the legs while in a sitting posture are two of the commonest signs of involvement of particular muscle groups.

Symptoms may develop with considerable rapidity, but the usual course is insidious. Patients may show, within a few weeks after onset, dysphagia, dysarthria, diplopia, ptosis, difficulty in chewing or even holding up the jaw, weakness in neck and extremities; occasionally most of these symptoms occur within 24 hours. The usual patient, however, is seen with one or more symptoms developing in a transient manner, with periods of remission often lasting weeks or months. Relapses then are noted, not always with the same symptoms first experienced. Some of the "spontaneous remissions," have lasted for twenty or more years, but ordinarily signs of the disease recur within a year or two.

When the throat muscles are severely involved, patients exhibit nasal regurgitation of liquids and inability to chew and swallow solids. Speech, when involved is of a nasal character. This symptom is not always accompanied by dysphagia. When the chest muscles are affected, respiration may become difficult with inability to clear the respiratory tract of mucus or fluids.

Walking, especially going up stairs, is often difficult, and any rapid motion in which the latent period of recovery is relatively short leads to early fatigue. The first symptom, indeed, may be difficulty in simple motions such as beating eggs, playing cards, brushing the hair or crossing the legs.

Sensory symptoms are almost unknown. Occasionally, patients complain of mild paresthesias of the extremities, but do not complain of pain. Heart action and other involuntary movements are not affected. Mental symptoms are not to be expected. In general, patients are remarkably cheerful in spite of the serious nature of their illness and need for constant medication over a long period of time.

PROGNOSIS.

Prior to 1934, when neostigmine treatment was instituted the disease was often fatal. About half of the patients died within weeks or months after the diagnosis was made. Since 1934, 80% of the patients seen at all ages may expect to survive the disease if adequately maintained on an appropriate schedule of treatment with neostigmine and other drugs. In a series of 286 patients observed by Viets over a period of 15 years, their ages ranging from a few days to seventy or more years, 21% were known to have died during this period, many of them in the older age group. Few deaths occurred from myasthenia; a few followed thymectomy before patients were adequately maintained by intravenous neostigmine during the operation. In rare instances a fulminating type of myasthenia is present, uncontrolled by medication.

DIAGNOSIS.

The diagnosis of myasthenia gravis is usually not difficult if a full history of the onset and progress of symptoms is obtained. Few other conditions present such a variety of muscular weaknesses, without pain or change in sensation, often transient in character, progressing by remissions and relapses. The disease should be suspected in patients of any age when sudden ptosis, diplopia, weakness of the mucles of mastication, difficulty in swallowing or talking, or undue fatigue in using the arms and legs occur without obvious cause. The response to neostigmine (prostigmine) is so prompt and complete in this disease and slight in any other condition that the drug is now used as a diagnostic test. For an adult, neostigmine metylsulfate and atropine sulfate are combined for subcutaneous or intramuscular injection. The response may be charted numerically, but in many cases the restoration of normal muscle movement in 15 to 30 minutes is so marked that the diagnosis is no longer in doubt.

As some of the early diagnostic tests were futile, the abnormal fatigability may usually be brought out by simple maneuvers designed to test the various muscles: shutting and opening the eyes in rapid succession, a similar movement with the tongue and repeated motions with the arms and legs. Holding the arms outstretched with the fingers fully extended is a simple test that often brings on fatigue remarkably quickly.

Crossing and uncrossing the legs rapidly may disclose signs of fatigability. The dynamometer may be used to register the grip, but repeated motions demonstrate the symptoms better than a single muscular effort. A simple ergograph readily demonstrates this fatigue curve. Whatever muscular movement is tested, there must be a return of power, at least in part, in all cases of myasthenia gravis after a period of rest. This is the essential nature of the disease, and the diagnosis should not be made without this feature being present.

Repeated stimulation of muscles by electrical means to demonstrate fatigue is now rarely used as a test. The "myasthenis reaction" of Jolly, however, is characteristic of the disease.

TREATMENT.

Many forms of treatment have been used in the past, but none except rest with avoidance of fatigue of the muscles involved were effective up to about 1930. Patients, however, were maintained in a marked state of invalidism by cautiously taking small amounts of food and carrying out the usual daily movements of the body interspaced with frequent and often prolonged periods of rest. In 1930 the use of ephedrine sulfate was introduced, and this proved to be a drug of moderate therapeutic efficacy. Potassium chloride may also be used; patients require relatively large doses. Today, most physicians use a drug, neostigmine bromide, which has been used since 1934. The writer gives this medical background only that the optometrist may better understand the physician's problem, as the optometrist will be working closely with him in the control of patients of this type and can aid him in his diagnosis.

In April, 1954, patient S. H. W. presented himself in my office with a marked ptosis and more than 30 degrees of exotropia and 23 degrees of left hypotropia. In conjunction with his physician, a diagnosis of myasthenia gravis was made. After relatively good progress in the reduction of the ptosis, the patient felt he was not able to return to work due to his diplopia and asked if I thought I could get him back to work sooner. I cautioned him of the nature of the disease, but he decided we would experimentally try orthoptics, being careful not to exaggerate the fatigue and would discontinue them if he appeared to be regressing. Rapid progress was made in the reduction of both muscular imbalances and after 6 weeks the patient manifested 1½ degrees of exophoria and 2 degrees of left hypophoria. A prescription was written correcting the hypophoria, that was subsequently reduced later when the hypophoria was only 1½ degrees. This was accomplished in spite of the fact that rest had been the previously prescribed procedure.

In May of 1955 a second patient, Dr. J. C. S., a semi-retired dentist, presented himself with a history of suddenly seeing double. His physician had diagnosed myasthenia gravis and the patient manifested 13½ degrees of left hypotropia with 4 degrees of exophoria at infinity and 23 degrees of left hypotropia with 15 degrees of exophoria at near. Since he was a professional man, the possibilities were outlined to him and he requested orthoptics which were instituted at that time. The various tests started June 30 and continued until December, 1955. There had been a gradual improvement, although much slower than the previous case. The correction was slowly modified in September. The patient was wearing 8½ degrees to correct left hypophoria and maintain single vision. In November this was reduced to 4 degrees, still maintaining single vision at near point as well as infinity. December 15, 1955, he was examined and found to have no vertical imbalance whatsoever. This was after orthoptics were discontinued at the beginning of December, and he continued to improve. Subsequent re-checks revealed no further hypophoria. It is possible that this is a period of remission and we may have trouble later, but I do not feel that such is the case.

ANNOUNCEMENT

SUMMER POST-GRADUATE COURSES FOR OPTOMETRISTS

Post-graduate courses for optometrists will be held at the following schools and colleges during June, 1956. For outlines of courses, cost and registration forms, in each case address the registrar.

Los Angeles College of Optometry, 950 West Jefferson Blvd., Los Angeles 7, California. June 11-22.

School of Optometry, The Ohio State University, Columbus, Ohio. June 25-29.

Pennsylvania State College of Optometry, Spencer and Twelfth Streets, Philadelphia, Pennsylvania. June 4-8.

CORRELATION OF SPEED AND DISTANCE JUDGMENT WITH VISUAL ACUITY*

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Iowa State College
Ames, Iowa

INTRODUCTION

Visual acuity is generally accepted as one of the criteria used to differentiate between ability and inability to operate a motor vehicle. Some form of visual test is administered upon the issuance of the driver's license in at least 43 states. It is obvious that far-point acuity is of greater importance in driving than near-point. There has been some difference of opinion as to why and to what extent vision is important to driving.

THE PURPOSE OF THE STUDY

The purpose of this study was to determine the relationship of far-point visual acuity to the judgment of distance and of speed, particularly as they relate to meeting oncoming cars or as the timing of vehicles to avoid collision at right-angle intersections.

The first objective was thus to determine whether significant correlations exist between binocular far-point acuity and ability to judge distance or to estimate speed as measured by the devices used in this investigation.

A second objective of the study was to determine whether there were sex differences in these abilities, and whether there were differences due to experience.

Several experimenters have made contributions in this field in addition to the classical work by Helmholz, Woodworth and others. A review of these studies has been amply made by Bartley in his book entitled "Vision."

Forbes early made studies on the relationship between speed estimation and accident susceptibility. Measurement of speed judgment of males and accidents showed a significant correlation in favor of those making the higher and more desirable scores on the distance and speed estimation.

Lauer and Winterstein showed that persons with inferior acuity, as measured by optometric methods, were poorer on distance judgment.

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This study was made possible through a grant for driving research made by the Allstate Insurance Company of Chicago, Illinois.

†Ph.D. Member of faculty.

‡Ph.D. Member of faculty. Fellow, American Academy of Optometry.

Vavra found sex differences in the judgment of following distances. Women apparently were more conservative in the estimation of distance. Whether this was due to a better estimation or whether it was due to greater caution was not investigated.

SCOPE AND NATURE OF THE STUDY

The present study involved measurements of visual acuity by the Sight Screener, a screening technique, and measurement of distance judgment on the Allgaier apparatus. Speed estimation was measured by an apparatus developed by the Chicago Motor Club based on an earlier model of DeSilva.

Fifty-four men and fifty-four women served as subjects in this investigation. The majority of these 108 individuals were students at Iowa State College. Many of them were enrolled in driver education courses. Subjects ranged in age from 18 to 61 years. The mean age of the males was 29.56 years and of females was 30.78 years.

The reliability of all the measures was satisfactory. The coefficients ran as high as 0.96 and as low as 0.80.

RESULTS OBTAINED

In this short presentation it will not be possible to cover all the results found, although a suitable statistical design was set up for analysis of the groups with relation to experience. The tables listed as Tables 1, 2 and 3, show the results.

SUMMARY AND CONCLUSIONS

A highly significant difference was found between the sexes in the judgment of distance, men exhibiting superior performance. Men were also more accurate in judgment of speed but the difference was not substantial.

Driving experience was not shown to substantially differentiate the groups with respect to the judgment of speed. This may be due to the fact that drivers improve very little in these basic functions after they once learn to drive.

A correlation of +0.09 was found between acuity, as measured by the Sight Screener, and speed estimation. This, of course, might be expected. The correlation between visual acuity and distance judgment for the entire sample was +0.20 which was significant. The highest correlation obtained was +0.51 between vision and distance judgment for the experienced male group. It was significant at the one per cent level of confidence.

One limitation of the experiment was that the drivers all had reasonably good vision which probably accounts for the lower correlations obtained. Homogeneity of the groups would tend to reduce any rela-

TABLE 1

Analysis of Variance of Speed and Distance Judgment Scores

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square	F
Judgments	1	35,792.50	35,792.50	108.77**
Sex	1	4,103.81	4,103.81	12.47**
Interaction	1	14.26	14.26	0.04
Within subgroups	212	69,761.76	329.06	

**Significant at the 1 per cent level.

TABLE 2

Analysis of Covariance of Speed Judgment Scores Residuals

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square	F
Experience	1	71.56	71.56	0.16
Sex	1	1,574.00	1,574.00	3.60
Interaction	1	2.24	2.24	0.01
Within subgroups	103	45,052.17	437.40	

TABLE 3

Analysis of Covariance of Distance Judgment Scores Residuals

Source of Variation	Degrees of Freedom	Sum of Squares	Mean Square	F
Experience	1	230.66	230.66	1.01
Sex	1	1,798.50	1,798.50	7.89**
Interaction	1	183.01	183.01	0.80
Within subgroups	103	23,486.28	228.02	

**Significant at the 1 per cent level.

tionships inherent in the data. Finally, it may be stated, that the study supports conclusions from two previous studies that poorer vision does interefere with distance judgment of an approaching car. It would, therefore, be wise to caution persons with poor vision to exercise considerable care in judging distance, particularly under conditions of low visibility when the perceptual distance is appreciably shortened.

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ACCOMPLISHMENTS AND PROBLEMS AT A.O.A. CONGRESS

In June the American Optometric Association will hold its Annual Congress at Miami Beach. Each year this meeting serves to highlight the practice trends and economic progress made by the profession. At this A.O.A. Congress the sociological and legislative phases of optometry are considered by the delegates and future plans and programs are made. This meeting will be an important one. Optometrists from all states are expected to be present in large numbers. Much of value will be done for optometry.

It is at times essential and encouraging to review the progress already made by the profession. This is particularly true just before the A.O.A. Annual Meeting starts. Such a backward glance serves to get existing problems into a true perspective. It indicates the value of

collective thinking and action on the part of all optometrists. To mention a few of the many vital improvements that have been brought about, we should point out the tremendous advancements already made in the professional aspects of optometric practice: the improvement made over the years in the undergraduate education of optometrists; the public's acceptance of optometry as an independent entity in the society of healing arts professions; that the improved economic status of optometrists has occurred with his greater reliance on professional fees; the advancements already made in the post-graduate aspects of optometric life; the development of our literature; optometric participation in public health and industrial programs; the improvements made in the legal and legislative aspects of optometric practice; the advancement made in lens design and frame styling to better the optometrist's dispensing services to his patients; the improvement that has come in instrumentation and equipment for our refracting rooms; the growing awareness of the need for eliminating the mark-up on materials dispensed for our patients; the fact that organized optometry, for the most part, is working as a united team with all major organizations cooperating with each other to the fullest possible extent. Reports from our schools and colleges, this year, indicate a marked increase in interest in under-graduate optometric education on the part of many young college men and women. Inquiries for enrollment next September are at a higher level than heretofore and we are supplying improved visual care for millions of patients who are now getting the finest refractive service ever offered.

While it is true that none of these accomplishments are complete, the fact that great progress has been made makes it possible to face the future with confidence. We will always have problems, but as the profession develops and advances, the nature and scope of these problems will change. In the face of these problems, it is true to say that optometry has made splendid progress in the past 60 years.

At the coming A.O.A. Congress some of the problems that will face the delegates are the work of continuing to eliminate the essentially commercial optometric practitioner; to develop more fully, a workable credit plan for patients of optometrists who wish this service; to improve interprofessional relations; to charter and develop additional State Optometric Associations Credit Unions to assist new practitioners in becoming established in practice; to get greater numerical coverage among optometrists in the A.O.A. program of accident and health insurance; to work more closely with our manufacturers and laboratories in the national program of vision conservation as developed through

the Better Vision Institute; to further strengthen the many aspects of the program of optometric public relations now carried on by the A.O.A.; to be prepared to repel attacks made upon optometry, and to make further study and plans to assist the public in supplying their refractive needs in private health programs.

It is evident from this brief review of our accomplishments and problems that the four-day Congress session at Miami Beach, June 13-16, will be interesting and worthwhile. A.O.A. members are urged to attend with their State delegates, to study and discuss these and other matters which will come before the Association. Through your attendance you will have a better understanding of what is now being done, and you will encourage your A.O.A. leadership in their work of making optometry an even finer profession.

CAREL C. KOCH

CURRENT COMMENTS

Terry Judith Parkins
Editorial Assistant

Optometrists will confer a favor by sending news items of general interest for this department; such as relate to new instruments, clinical techniques, education, visual health and optometric legislation and organization.

MIAMI BEACH IN JUNE

Just about one-half of our optometric readers are members of the American Optometric Association, and this might be a good place to say that the half who are *not* members, should now join. To the members of the A. O. A. this material is presented to urge them to attend the annual Congress of the A. O. A. in Miami Beach, Florida, June 13-16, 1956, at the Saville Hotel.

For a variety of reasons, members should be there. In the first place, from wherever you practice to Miami Beach is an interesting trip. For most optometrists it will take them through a large part of the country and June is a good month in which to fly, ride or drive.

In attending the Congress you will renew old friendships and make new ones. You will spend a few days in a fabulous resort spot with ocean bathing in a semi-tropical area. You will listen to the reports of our A. O. A. officers and committee chairmen and you can watch the House of Delegates in action. In addition, you will hear several good educational lectures and spend hours visiting a large number of top-flight optical commercial exhibits. The trip to Miami Beach

will prove to be a pleasant experience and those optometrists who go should have a real good time in this famous vacation spot.

MEETING HIGH LIGHTS

In addition to the regular meetings of the House of Delegates of the A. O. A., June 13-16, the following special meetings will be held in Miami Beach. A. O. A. Council on Education, June 11-12; American Optometric Foundation, June 11 and June 15; International Association of Boards, June 12-15; A. O. A. Women's Auxiliary, June 12-16; luncheon, Beta Sigma Kappa, June 13; Alumni luncheons for Illinois College of Optometry, Pennsylvania State College of Optometry, and Southern College of Optometry, June 14; luncheon, American Academy of Optometry, June 15; Association of Schools and Colleges of Optometry, June 17-18. The annual banquet of the A. O. A. will be held in the Grand Ballroom, Saville Hotel, June 16.

EDUCATIONAL MEETINGS

The following educational sessions have been scheduled for the A. O. A. Miami Beach Congress. June 13, 2:00 P.M. "Up-dating Your Practice to Up-date Optometry," by Dr. Don Frantz, Dekalb, Illinois. Dr. Frantz is secretary of the A. O. A. Council on Education, Fellow, American Academy of Optometry and lecturer at recent A. O. A. Four Star Forums. His talk deals with practice building techniques available to ethical optometrists. Also, June 13, 3:30 P.M. "Geriatrics and Optometry," by Dr. Ralph Wick, Rapid City, South Dakota. Dr. Wick is past president of the South Dakota Optometric Association, Fellow, American Academy of Optometry and member of its Executive Council. He is author of several studies dealing with the optometric assistance to be given our senior patients.

June 14, 2:15 P. M. "Optometrist and Reading Specialist," by Dr. George Spache, Reading Clinic, University of Florida, and 2:45 P. M., "Coordination of Reading and Visual Skills," by Dr. Richard Apell, Gesell Institute, New Haven, Connecticut.

June 15, 9:00 A. M. "Future Health Needs from the Viewpoint of Labor," by Mr. John Brumm, educational director, International Association of Machinists. This talk will be followed by a panel discussion at 10:00 A. M. to be lead by Mr. Brumm, Dr. F. Koetting of St. Louis, Missouri, chairman of the A. O. A. committee on Social and Health Care Trends and Fellow, American Academy of Optometry, and Mr. David Sharman, of the staff of the A. O. A.

EXHIBITS

Instruments, lenses, frames, equipment, books and other aids to optometrists attending the A. O. A. Congress at Miami Beach will make

the Exhibit Hall a popular place at the meeting. Optometrists attending the Congress will have many fine exhibits to visit and will come away from the convention with a comprehensive knowledge of what-is-new. A visit to these exhibits is a great opportunity to inspect and discuss the latest in frames and lenses and the large Exhibit Hall will be packed with optometric exhibits of value. For many, these exhibits in themselves make the trip to Miami Beach worthwhile. Among the exhibitors will be the following firms who have supplied us with a review of their coming exhibits:

AMERICAN OPTICAL COMPANY divisions will have their newest ophthalmic equipment and materials at the AOA Convention. New items have been introduced, expanding nearly all lines, and many will be shown for the first time at the convention.

The AO Instrument Division has its new *Deluxe Refracting Chair*, new *Electric Instrument Table*, new *Fitting Table and Chair*, and the new *Ful-Vue Streak Retinoscope* and *Duraflex Eye Specialist Diagnostic Set*.

Two main features of the AO Lens line will be the *Executive Bifocal*, which is finding favor with the professions and patients with a wide variety of needs, and the new *Microscopic Bifocal*, which restores reading vision for many patients in the near-blind category. Also the complete line of AO frames will be shown, including the *Red Dot line* and the latest introductions of the AO frame program.

There will be a "do-it-yourself" demonstration of AO optical machinery to permit those visiting the AO exhibit to familiarize themselves with their operating procedures. Items on display will include the *Lens Cutter, Lens Layout Marker, Bevel-Matic Edger* and optical tools.

The 1956 line of *Cosmetan* and *Calobar Sun Glasses* will be on display, and a complete assortment of ophthalmic cases in a wide variety of materials and colors will be shown. There will be a new, large aluminum-bodied case for combination frames.

ART-CRAFT OPTICAL COMPANY will display their latest frames at the A.O.A. Congress. Featured will be the recently introduced *Holiday Art-Rim*, one frame convertible to three lens shapes and adaptable for both men and women. Art-Craft will also show their suggestions for the "young look" with their new *Nanette* and *Colleen* frames which combine crystal and colored zyl with unusual effectiveness.

A lot of interest will center, also, around the *Art-Rim Leading Lady*. Striking new color additions, and the many Art-Craft trims that add a touch of jewelry, will be high lighted. The entire Art-Craft line of frames for men, women and children will be on exhibit, with the latest additions "modeled" in color transparencies to demonstrate their "on-the-face" attractiveness.

BAUSCH & LOMB OPTICAL COMPANY will feature the new DeLuxe Refracting Unit with Motor Chair as well as other ophthalmic and diagnostic instruments. The new frame styles and color treatments including men's and women's *Ray-Ban Sun Glasses* will be displayed in the *Harmony Frame Bar* which will be shown for the first time. *Panoptik* and *Orthogon*, in the new lens sizes, will also be on exhibit.

Richard Eisenhart will be in charge of the exhibit, and will be assisted by Bausch & Lomb personnel. The following will be in attendance from the factory: George H. Phreaner, Sales Manager of the Ophthalmic Division; Howard Trimby, Manager of Ophthalmic Instrument and Industrial Vision Sales; Richard H. Eisenhart, Manager of Frame and Case Sales; Earnest F. Swart, Manager of Ophthalmic Lens Sales. The following will be in attendance from B. & L. Divisions: Walter S. Galeski, Manager, B. & L. Southeastern Division; S. A. Klein, Manager, B. & L. Northeastern Division; W. M. Broyles, Sales Manager, B. & L. Central Division and A. T. Vannerson, Manager, Atlanta District, B. & L. Southeastern Division.

CONTINENTAL OPTICAL COMPANY will feature the fine 1956 lines of high fashion frames, the *Ladysfram*, a combination of zyl and gold filled, which has already been launched, and four other lines, the last of which is scheduled for presentation to the profession about the time of the convention. The other three are due to come out between now and the convention date. Comprising the four not yet presented is a new all metal frame for women called *Satintone*. It has a soft satin finish and is quite beautiful. There is an all metal frame for men called the *Continental* and a zyl line for women called *Zylmaid* with a companion line for men known as *Zylmaster*. The frames will be shown at the exhibit against a lighted, jewelry type background that gives easy access to the doctor who cares to look and examine.

At Miami Beach, Continental will also show the latest developments in *Korova* single vision lenses, *Kurova F* fused bifocals and *Ultex* one-piece bifocals and trifocals.

Three Continental executives will be at the A. O. A. Congress. Floyd Wimmer and Katherine Cleaver of Indianapolis and Russ Powell from the Atlanta office.

HUDSON OPTICAL CORPORATION announces two new frames in a wide variety of colors. These are the *Camilla* and *Q-tee*. They will be shown at the A. O. A. Congress together with *Seville*, a man's frame of unusual design. The *Camilla* is an all metal frame with eye wire and bridge of 1/10 12K gold-filled. It comes in ebony, gold, silver, bronze, mocha, cherry, orchid, rose, pastel blue and dusk blue. The *Q-tee* is a metal and zyl frame with smart lines in many color combinations of both metal and zyl.

The *Seville* was designed to provide one frame model that can be adapted to most faces. Two patterns are available, the basic square-cut shape and the rounded bottom. The frame is made both in metal and zyl and zyl alone.

Hudson Optical Corp. will be represented at the A. O. A. Congress by Irving Hirschman, president of the Company and Sam Paris and George Rutkowitz.

THE KEYSTONE VIEW COMPANY will exhibit several new developments in visual training and testing. The new *Professional Performance Tests*, the successor to the DB Skills for binocular testing should be of interest to all optometrists. Also the new *Colordepth Strabismus* techniques offer to optometrists advanced techniques in the diagnosis and training of strabismus. The *O'Brien Central Fields Screening Charts* will also be at the Keystone exhibit and it is claimed that these offer a simple and direct means of screening for pathology affecting the optic tracts. A full display of orthoptic instruments and materials will be shown at the Keystone exhibit.

THE KONO MANUFACTURING COMPANY plans to use one-half of their space for exhibit purposes and will concentrate on their new frame, the *Captive*. Along with this, Kono will show their interesting line of special devices for peculiar ocular problems, and will also display a number of the zany frames which mildly poke fun at the industry's collective efforts and for which Kono has become quite famous. Kono hopes to outdo themselves this year on these inane frames.

They plan to use the other half of their space as a comfortable sitting area for optometrists where they might meet and chat.

E. W. Smith will be in charge of the exhibit and they plan to have five salesmen in attendance combining the A. O. A. meeting with a sales meeting of their own. A model will wear Kono's many stylish frames.

LIBERTY OPTICAL COMPANY. The feature in this year's Liberty exhibit will be the dainty *Libby* frame for women, according to Joseph G. Bianco, Liberty General Manager. Graceful, lightweight styling is the outstanding feature of the *Libby* and Bianco has announced plans to exhibit the frame's many colors with new anodized trim and temples.

In addition, Liberty will display their usual fine line of optical frames including the *Broker 215*, *Par Keyhole*, and *Soubrette*.

On hand to greet visitors and friends will be Anthony DiChiara, president of the Company, Joe Bianco, in charge of the Liberty exhibit, and Murray Becker and Jim Lacey.

MARINE OPTICAL COMPANY will exhibit two new frames that will occupy the spotlight—the *Mariner* and the *Sari-Viv*. The *Mariner* frame, according to Hugo M. Ditto, Marine treasurer, is a "real masculine frame—neat and trim with the cleanout lines that appeal to discriminating men." It will be shown in briar-lite, flannel gray, solid, two-tone, or with clear bridge.

Marine's new woman's frame, *Sari-Viv* introduces a new application of plastic and metal. The frame features colorful hand-engraved anodized aluminum plaques on clear plastic fronts and *Taperflo* temples that are easily adjustable without heating. The frame comes in mink, sapphire, ruby, gold, orchid and ebony.

At Miami Beach the Marine Company will be represented by Eugene D. Ditto, Herbert O. Boellhoff, Arthur Collins and Jack Hicks.

MODERN OPTICS will present the *Modernare* at the A. O. A. Congress. Instructions on point-light-source lens inspection will be given by Frank Webster, Virgil Hancock, Paul Hancock and Rex Arrowsmith. Also discussed at Modern's exhibit will be an encyclopedia of on-the-job visual tasks and what to do about them. The lenses displayed will feature *Gradientan* and Modern's monocentric seg 3-way lens.

C. V. MOSBY COMPANY will exhibit its complete line of books with particular emphasis on books of interest to optometrists. Included among the titles that will be displayed at the Mosby exhibit will be the following: Barber, *Embryology of the Human Eye*; Duke-Elder, *Textbook of Ophthalmology*, Volumes 5, 6, and 7; Guyner-Bruger, *Prevention of Diseases in Everyday Practice*; Hughes, *Reconstructive Surgery of the Eyelids*; Kramer, *Clinical Orthoptics*; Pascal, *Visual Optics*; Pascal-Noyes, *The Optometrist's Handbook of Eye Diseases*; Rycroft, *Corneal Grafts*; Scobee, *The Oculorotary Muscles*; Scobee-Katzin, *Rehabilitation of a Child's Eyes*; Smith, *Clinical Orthoptic Procedure*; Sorsby, *Systemic Ophthalmology*; Tassman, *Eye Manifestations of Internal Diseases*, and Weinstein-Foldes, *Glaucoma*.

THE OPTICASE COMPANY will feature the popular eyeglass cases, *Spectoter*, *Full-Grain Cowhide*, *Clip Case*, and *Cowhide Vinyl* according to Emanuel Nathan, spokesman for the firm. The *Spectoter* has a full plastic lower section and a choice of materials in the overlap. *Full-Grain Cowhide* with skiver lining is available in open-end or fold over style. *Clip Case*, with matching leather-covered clip may be attached to a pocket or to the sun visor of a car. Jim Lacey and Emanuel Nathan will be at the Opticase exhibit.

THE PLASTIC CONTACT LENS COMPANY will present an accelerated demonstration and explanation of the *Wesley-Jessen* microlenses. To highlight the growth of contact lenses, a giant poster will greet optometrists as they enter the exhibit hall, displaying a variety of contact lenses used over the years. Dr. N. K. Wesley, Dr. Edward J. Lenzen and Pat Morrisey will be on hand to explain the *Wesley-Jessen* lenses in relation to keratoconus and aphakia cases as well as other uses. Also on display will be a complete line of scleral and cornea cosmetic lenses, equipment used in contact lens practice and samples of lenticular microlenses.

SHURON OPTICAL COMPANY will exhibit their complete line of ophthalmic materials. This will include the brilliantly styled *Ronfair* and *Rongay* aluminum frames, the *Ronsir*, *Ronbelle* and *Rondeb Browline* frames in many colors, the *Ronartte Custom Service* and the 10K gold *Artte Chest*, new spectacle cases, and many other items, including super soft cases with anodized aluminum "bars."

Shuron will also exhibit their complete corrected curve lens line in white, *Tonetex* and *Greentex* for prescription use. The Company will be represented at the convention by D. G. Garvin, Harry E. Denman, C. P. Bourbeau and C. H. Mallery.

STYLE-RITE OPTICS CORPORATION will exhibit their new fashion frame *The Jeweled Spectrum* which is an innovation in color frames, being made from a combination of featherweight metal alloy stylume and zyl. Each frame is set with simulated diamonds or seed pearls in unusual etched patterns. Sam Pommerantz of the Miami factory will be in charge of the exhibit.

THE TITMUS OPTICAL COMPANY will exhibit its complete line of corrective courve ophthalmic lenses as well as its new and attractive frame line headed by the *Gisele* frame for women in three metallic colors, gold, blue and black with the hand engraved alumilite trim.

At the Congress Titmus will be represented by E. H. Titmus, Jr., "Pete" Collier, "Hutt" Huttmeyer, Bert Nordquist and Bud Kabian.

UNIVERSAL OPTICAL COMPANY will exhibit all of the company's current products and latest styles in frames. Several new frames will be introduced at the Congress having new designs and new colors. W. J. Murray, Jr., is in charge of the Universal exhibit.

THE UNIVIS LENS COMPANY display will feature the "New Look" in lenses. Four new Univis lens styles will be shown. These are the new *Univis Nu-Line D-25*, a bifocal with special line treatment for wide segment bifocals; the *CV-6 25 lens*, an improved design 3-foci lens now available in wide segment; *Nu-Line 7 CV 25*, the Univis continuous vision lens designed to reduce reflection and refraction from the segment lines and now available in 25 mm. segment size. Top place in the exhibit will go to the new *Univis Ultra CV* which is especially made for those patients seeking the finest in visual performance regardless of price. A process display will enable the optometrist to examine the construction of the new *Univis Ultra CV*.

In frames, Univis will be introducing its new *Belle Caroline* and *Belle Caroline Societe*. These women's frames have new color silhouette, youthful eye shape, and wide color selection. The complete line of *Beau Alan* frames for men will also be at the Univis exhibit.

VICTORY OPTICAL MANUFACTURING COMPANY has introduced *Princess Terry*, latest variation in the popular *Terry* line of frames. Featuring a glamorous jewel-like trim, *Princess Terry* is available in a wide selection of onyx color combinations. Also announced is the new *Commentator* frame for men with the redesigned temple. This frame is also made in sizes for boys.

At the convention Victory will also show two new feminine frames, *Marguerita* and *Nickie*, both reported to be distinctively different. Victory will be represented at the A. O. A. Congress by Vincent Salierno, president, A. J. Bartolotta, William Marfuggi, Ephraim Gross and Erwin Wolfe.

THE VISION-EASE CORPORATION plan to feature their temporary cataract lenses, *Catarex T* at the A. O. A. Congress according to Eldon R. Siehl, president. In addition the company will display the many steps in the manufacture of a typical multifocal lens. This will be done in a motion-packed exhibit outlining all parts of the operation. The complete line of Vision-Ease multifocals will be on display. On hand to greet convention visitors and tell the *Catarex T* story will be L. I. Withington Warren R. Cook and president Siehl.

ZYLITE PRODUCTS COMPANY has designed an exciting new exhibit. This exhibit, highlighting the importance of smart frame fashions, will be unveiled for the first time in Miami Beach. Featured in the display will be *Trend* which, in its many variations, will provide men with youthful frame styles.

Also making its debut will be *Nice*, the latest addition to the frame program which was launched with *Sugar* and *Spice* earlier this year.

On hand to greet Zylite's many friends will be Artie Johnson, Bob Schnure and Charlie Ladew.

ZYLO WARE CORPORATION will exhibit a group of new attractive frames to be shown for the first time at the Miami Beach Convention. Joseph Shyer will be in charge of the exhibit.

HELMHOLTZ MEETING AT NEW YORK ACADEMY

In celebration of the Hermann von Helmholtz Centennial the New York Academy of Optometry has arranged for a panel of speakers to discuss various aspects of his work in the field of optics and vision.

The following educators will participate in this program: Helmholtz's work in the field of Physical Optics, by Professor Edwin Bechtold of Columbia University. Helmholtz's works in Psychological Optics, by Professor Alfred Lit and Professor Daniel Woolf of Columbia University. As an introduction to this program a brief biographical history of Herman von Helmholtz will be given by Dr. William P. Schumann of New Jersey. This meeting is scheduled for May 15, 1956, at the Midston House, New York City.

SCIENTISTS SPEAK AT OHIO STATE

The School of Optometry, The Institute for Research in Vision and The Graduate School of The Ohio State University were hosts to two distinguished international visitors on April 9, 1956. They were Professor Jose M. Otero of Madrid, Spain, and Professor Albert Arnulf of Paris, France. Each gave a public lecture and also conducted a seminar in the School of Optometry. Many optometrists availed themselves of the opportunity to hear these lectures.

Professor Otero is director of the Institute of Optics in Madrid, vice-president of the Atomic Energy Commission of Spain, and occupies official positions in many international optical organizations. He is a world authority on night myopia, which was the topic of his lecture.

Professor Arnulf holds a chair at the Sorborne and is also Director of the Laboratories of the Institute of Optics in Paris. His researches on the optical properties of the human eye are very well known and respected, and he has carried out many important studies in other phases of optics. His topic was "Studies in the Optical Image of the Eye." Both men were visiting this country to attend the meeting of the International Commission on Optics in Boston and also the meeting of the Optical Society of America in Philadelphia.

BROWN OUTLINES A.O.A. HEARING AID POLICIES

Dr. S. L. Brown, Past President of A.O.A., was speaker at the Hearing Aid Industry Conference, New York, April 24. He explained why it would be inconsistent with professionalism for any optometrist to sell hearing aids or to become a manufacturer's representative. He urged that the optometrist and the hearing-aid technician should each

stay in his specialty, but that they should cooperate to serve the patient's needs.

"When the correction of hearing involves materials that are necessary for the correction of vision, we should let the optometrist take exactly, and only, the responsibilities that he now has with any other frame," he said.

"The optometrist untrained in hearing must leave such matters to the hearing-aid technician, and since your technician is untrained in vision and frame fitting, it is to his advantage, I think, to leave the frame fitting or detailed instructions to the optometrist.

"A hearing aid customer seeking visual correction should be referred to the visual practitioner of his choice, and a vision patient seeking a hearing aid should be referred to the hearing-aid technician of his choice.

"The hearing-aid technician should be responsible for the hearing aid and collect his fee for the materials and services he supplies. The optometrist should be responsible for the visual correction and collect his fee separately, and there should be no financial transaction between the optometrist and the hearing-aid technician or company."

NEW DISPARATOR ATTACHMENT FOR OMNITRAINER

A new Disparator attachment being introduced by Armco Mercantile Company adds more versatility to the Standard Model Omnitrainer. The optometrist often trains only at one or two intermediate points in addition to near point and infinity. At best, he approximates the desired prismatic effect of his split targets in relation to the training point. The new attachment alters this situation, in that approximation is replaced by certainty at all training distances. It enables the operator to set the separation of the targets at orthophoria or any desired prismatic effect, and then *maintain automatically* the same effect at all other training distances. All standard split targets are usable. The Disparator attachment can be affixed to the Standard Omnitrainer and is detachable when not using Disparator techniques. A monograph explaining Omnitrainer Disparator theory and practice is available from the Armco Mercantile Company, 221 N. LaSalle St., Chicago 1, Illinois.

NEWS BRIEFS

Dr. Monroe J. Hirsch was elected to the Ojai, California, City Council, April 12. He received the largest number of votes of any candidate. . . . The Nebraska Optometric Association is holding its annual meeting in Omaha, May 13-15. Dr. George E. Semerad is general chairman. . . . Dr. Mervin J. Kelly, president of the Bell Tele-

phone Laboratories, New York City, has been elected to the board of directors of the Bausch and Lomb Optical Company. . . . Dr. Eugene Freeman, Chicago, lectured to the senior students of the Indiana University Division of Optometry on May 3, at Bloomington, Indiana. His topics were, "Practice Stabilization" and "Subnormal Vision Aids." . . . Dr. E. G. Wilhite, Bedford, Indiana, was elected president of the Indiana Optometric Association at its annual meeting at Indianapolis. . . . Dr. Arthur Tillisch, Minneapolis, was elected president of the Minnesota State Optometric Association at its annual meeting in Minneapolis. . . . Dr. Howard S. Coleman, physicist, who directed the development of the B. & L. CinemaScope lenses has been appointed manager of the research division of the Bausch & Lomb Optical Company. . . . Dr. Carl F. Shepard, Illinois College of Optometry, spoke before the Northeast Indiana Optometric Society on the "Meaning of Visual Screening Tests" at Fort Wayne, April 19. . . . Dr. A. M. Skeffington, director of education for the Optometric Extension Program, was elected to membership in the Purdue Chapter of the Society of Sigma Xi on April 18, at Purdue University, Lafayette, Indiana. . . . Shuron has launched a new advertising technique to increase the impact of the visual care message now appearing in the SATURDAY EVENING POST. The technique is of special interest to optometrists since it makes use of a visual phenomenon to direct attention to visual care. It is the application of the Gestalt figure-ground studies in visual perception used in this series of ads. The first advertisement appeared in the May 12 issue.

TRANSACTIONS OF THE AMERICAN ACADEMY OF OPTOMETRY

A department devoted to announcements, reports, appointments, organization data, news, professional problems and ideals, as these relate to the Academy.

NEW MEMBERS

The following optometrists, educators and scientists have been elected to Fellowship in the American Academy of Optometry. The Executive Council welcomes these new members.

Dr. Marvin R. Berman, 303 Lockerman St., Dover, Delaware.

Dr. Gerhard A. Brecher, Department of Physiology 965, The Ohio State University, Columbus, Ohio.

Mr. Patrick Courlander, 56 George St., Richmond, Surrey, England.

Dr. John Brooks Link, Los Angeles College of Optometry, 950 W. Jefferson St., Los Angeles, California.

Dr. Y. K. Look, 206 Capitol Investment Bldg., Honolulu, Hawaii.

Dr. Gordon H. McKee, R.O., 608 Dominion Bldg., Vancouver, British Columbia, Canada.

Dr. Gordon W. McKee, 37 Water St., Excelsior, Minnesota.

Dr. Marshall V. Mark, 80 Boylston St., Boston, Massachusetts.

Dr. William F. Moor, 16 Erial Road, Clementon, New Jersey.

Dr. Melvin Charles Nadell, Los Angeles College of Optometry, 950 W. Jefferson St., Los Angeles, California.

Mr. A. H. Wright, 21 Castellain Road, London, W. 9, England.

BOOK REVIEW

VISUAL SKILLS. B. E. Kehl, O.D. Member of faculty, Southern College of Optometry, 1246 Union Ave., Memphis, Tenn. 90 pages, illustrated. Board covers. $4. 1956.

For a long time there has been a need to classify, describe and explain the many visual skills tests used in optometric offices. Dr. Kehl has very efficiently performed this job and not only her students but all other readers will benefit from this cataloging.

In a brief introduction, the author explains the purpose of the visual skills, which are "additional informative findings, exploring phases of the visual process, other than those obtained during the standard routine," and also the patient "may be given the opportunity of seeing what happens in the visual process in a concrete demonstration."

In addition to the well known Keystone Skills Cards, the manipulatory tests are discussed and followed by specialized techniques developed by such men as Brock, Renshaw, Lange, Van Orden and others. Explanatory drawings as well as photographs of the instruments used make it easy to comprehend Dr. Kehl's description. The reader will be interested to find out why the results of the telebinocular series do not conform to those found during the subjective examination and it may be for that reason that the newer Keystone series (not yet described in this book) which give readings in prism diopters, will not become as popular as the older series. However, this reviewer never did find out

why the Keystone Company abandoned the original Four Ball Fusion test, in which the center white ball was shaped like a face on one side, which made it easier to differentiate fusion from suppression. There seems to be an error in the description of the cards used for testing spatial projection. AN 9 is described as a distance target and AN 10 as a near target, whereas the illustration and actual cards suggest the reverse.

Further tests range from the important and much used "cover test," which practitioners might prefer to perform with an occluder rather than with the bare hand, to such specialized techniques as size constancy, tachistoscopic span and zone of perception. Readers will agree that the listing of all these tests does not mean that all must be used routinely and Dr. Kehl states so in her foreword. The book is concluded with three appendices, the first of which contains skills for strabismics and before prescribing visual training ALL of these should be attempted. The second appendix lists tests for children and the third one contains questions based on material in the book.

Much can be learned from this volume both by optometric novices and "old timers" and it is to be hoped that its circulation will not be confined to S. C. O. students. A little rewriting would well qualify the book for a hard-cover edition.

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SPECIAL REPORT

SCLERAL TONOMETRY FOR OPTOMETRY*

Henry L. Wolfe†
Marshalltown, Iowa

I have been asked many times whether I think optometrists should do scleral tonometry or use a tonometer of any kind on their patients. I have been asked by individual optometrists, "Should I use a tonometer on my patients and if so, why and how?"

The purpose of this paper is to clarify the reasoning and thoughts behind the suggestion of scleral tonometry to optometry. This, in turn,

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will give each optometrist a better understanding of the tonometer and whether or not it is worthwhile for his patients.

Some of the statements which I shall make will offend some optometrists, some physicians and some ophthalmologists. I apologize beforehand. However, when I am finished, I hope you will agree with our viewpoints. The scleral tonometer was devised by the late Otis R. Wolfe, M.D., my father, because he saw a threat to public health as it relates to eye care. This threat is hard to explain, but it is a problem.

When my father was practicing, a great proportion of the patients seen by him were referred by optometrists. He very seldom had a patient referred because of glaucoma, but in almost 5 per cent of the patients referred for other pathological problems, he found glaucoma. Among unreferred cases of pathology, the same relationship existed. In many of both types, the history indicated that the patient had seen a doctor, had or had not been given glasses, but nothing more was done in most instances and the patient was still having a great deal of discomfort. Someone had missed a diagnosis. The patient had glaucoma. Missed diagnoses were equally prevalent for optometrist and oculist. Otis Wolfe's own feeling was that every patient over 45 years of age should be considered as having glaucoma until it was proven otherwise. Yet he found a great amount of glaucoma going undiagnosed.

In the course of his lecturing and teaching Otis Wolfe attempted to find out why glaucoma was going undetected. This problem was prevalent then, and is equally as prevalent now. This was the reason for his untiring effort to give optometrists and physicians other than ophthalmologists (who are already equipped with instruments and other diagnostic equipment) one more device to better detect one of the most insidious diseases. Glaucoma was and is going undetected. Ophthalmology had the diagnostic instruments and the freedom of the use of drugs. Optometry did not have these things. Because they were competitors, optometrists were reluctant to refer patients to ophthalmologists unless they felt sure that some pathologic problem was present. There was little cooperation between the two professions. My father's ambition was to rectify that situation. He wanted to prove that the professions could work together, which he did. Optometry could recognize pathology, but they were missing some glaucoma patients because certain optometrists had no good working relationship with an ophthalmologist. Therefore, they must have all the diagnostic equipment necessary to help determine which of their patients should be directed to ophthalmology. Glaucoma was going undetected for two

reasons: (1) optometry did not have the necessary diagnostic equipment, and (2) there was little cooperation between the professions.

Let us face facts. Optometry and medicine are not fully cooperating. I hope to see the day they will. Some optometrists are not fully living up to the highest standards of their profession because they are not referring all their pathologic cases to ophthalmology. Some ophthalmologists are not practicing in accord with the highest ethical standards because they are not referring patients back to the source. Public health is suffering because of these conditions, and neither of the professions is doing the best possible job for society.

Because of these things, Otis Wolfe knew optometry needed a tonometric device. Optometrists could do fields, but they couldn't do provocative tests without a tonometric device. They could not get regular tonometric findings on each individual patient, when seen intermittently, to determine whether the patient's intra-ocular pressures were of a stable nature.

Many optometrists are today using the scleral tonometer. Whether they are using it properly, I do not know, but I believe most of them are. The Wolfe scleral tonometer is a diagnostic instrument, which alone will not diagnose glaucoma. It can only be used in conjunction with other devices and tests. Optometry has available some of these such as a tangent screen and provocative tests like the dark room test or the water test. The use of contact lens devices for differentiating between narrow and wide angle glaucomas is a possibility. The use of a slit-lamp will I believe become a routine practice among optometrists.

Optometry has at its disposal, through many articles and progressive practitioners of ophthalmology, who offer assistance to individual optometrists, a wealth of material for learning more and more about glaucoma. So much is available if our profession will only use it. I do not believe optometry has at its disposal all of the necessary devices or present knowledge to detect all glaucoma patients. Ophthalmology has some advantage in this regard, but the optometrist can demonstrate that a patient does not have this disease by proper use of his techniques. Those proven to have glaucoma, and the doubtful cases, should be referred for care or further testing by an ophthalmologist.

Each individual optometrist must reach his own decision as to whether he should routinely use the Wolfe scleral tonometer in his practice. Let me give suggestions on how to arrive at a conclusion. The first matter which must be reviewed is this: Do you have an ophthalmologist near enough to you to whom you can refer all pathologic or all questionable cases for consultation? Next, do you refer a patient

properly to your consulting ophthalmologist? By that is meant a letter written to him with your history, your findings in relationship to your history, advice as to any little eccentricities of the patient and, of extreme importance, your verbatim advice to the patient so the ophthalmologist will have some understanding of how to advise, how to correlate his advice with yours and not to confuse the advice by being contrary to yours, in case of disagreement. Do you insist on the patient seeing *his* choice or *your* choice of ophthalmologist, and do you help him by making the appointment and preparing him for his appointment?

Let me digress here to express my views on patient referral. Because of the tremendous amount of referral work in all categories at the Wolfe clinic we have had occasion to see most of the usual and unusual problems. This is a big subject, and the following is the pattern we use at the clinic:

The patient is given a choice of practitioners whom we consider reliable, ethical and in whom we have confidence. Preferably, *we* suggest the one whom we consider most competent. The appointment is made for the patient by letter, or by telephone in an emergency. In that letter goes the patient's symptoms, necessary information as to vision, correction, any radical changes in vision and correction, what we suspect his trouble to be and our advice to the patient and family. If a telephone call is made for an appointment, the letter still goes to the doctor and, incidentally, he is advised if the patient is a referred patient by another professional man.

If all practitioners would use this method, I know our problem would be much easier. I know, also, no referring doctor would be offended by conditions beyond our control. I know patients would today be receiving better eye care if referrals had been properly made and received over the years. I sincerely believe more misunderstandings occur between the medical and optometric professions because of faulty referrals than for any other single reason.

While we are on the subject, I have never seen a good ophthalmologist who would not be willing to work with a good optometrist, and vice versa. An optometrist trying to do good work, practicing within his professional limits, has it within his power to have a good working relationship with some ophthalmologist. I know of some optometrists and ophthalmologists no professional man would cooperate with and that statement can be applied to all professions. I know of many ophthalmologists and optometrists with whom you would consider it a pleasure to work with.

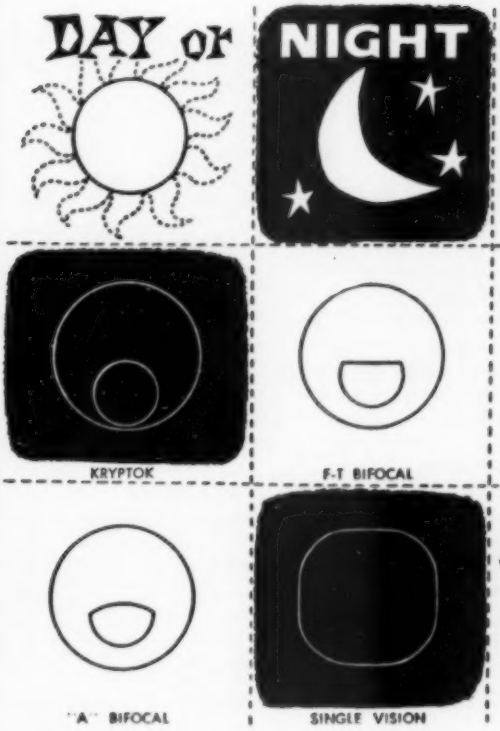
Then the questions arise, "When do I feel a patient should be referred to an ophthalmologist?" Whenever vision is not normal, whenever any of the retinal, fundus or corneal reflexes are in question or whenever the utmost is done to free the patient of his complaints, yet the complaints persist. The final and most important reason is whenever any pathology is apparent, regardless of the degree.

In addition to ophthalmological availability and cooperation and a proper referral procedure, the optometrist should, and most do, have a thorough knowledge of glaucoma from the standpoint of its detection. He should understand the provocative tests and the visual fields —how to make them and their significance. With this, should be the desire to learn more of this pathological state and to keep abreast of the subject from year to year.

An ethical optometric practice is essential and a physician should be near by to assist in making the tests if necessary. In addition, the optometrist must be willing to spend at least a year working with the scleral tonometer in his own office before placing complete confidence in the findings. The technique of handling and using the instrument is one that can be only acquired with use. Once this has been accomplished the optometrist may then use the instrument with complete confidence, and its findings will be of value. In using the instrument optometrists should consider only the diagnostic value of the technique. And last, optometrists in referring cases of glaucoma to ophthalmologists should support him in the use of medications for the control of the problem. The optometrist whose practice and knowledge is in agreement with the suggested requirements should be using the Wolfe scleral tonometer in his day to day practice.

There are then many optometrists who should be using a scleral tonometer and some who should not. The instrument is a good instrument. It is the most accurate of all tonometers and with the least amount of friction except for the electrical tonometer. It is accurate. If your findings vary considerably, it is your technique. You can only practice technique by using the instrument until it is familiar to you and is used identically on every patient. It takes time and a great deal of it.

With a knowledge of glaucoma and a willingness to learn, even if you find the instrument not usable for you, you will find you have learned a great deal more about glaucoma than you knew before. With its use comes a necessary study and use of other diagnostic aids. So, you must learn and know how to do provocative tests. With these things, a desire to serve your patient better, a willingness and courage to continue studying and learning, the Wolfe scleral tonometer can be of benefit to your practice and, of course, to your patient.



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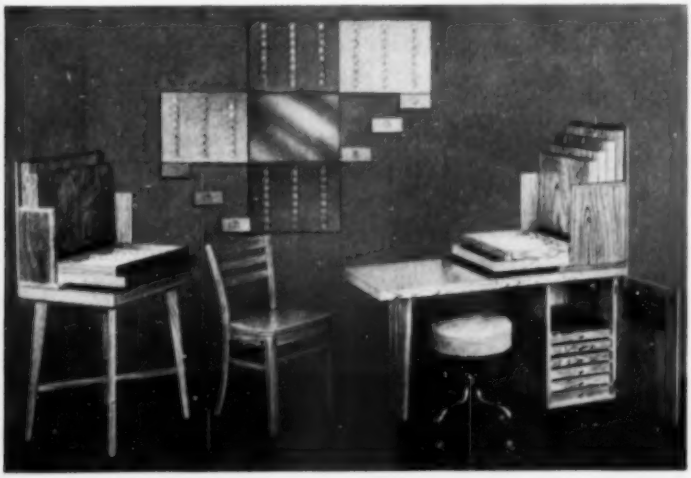

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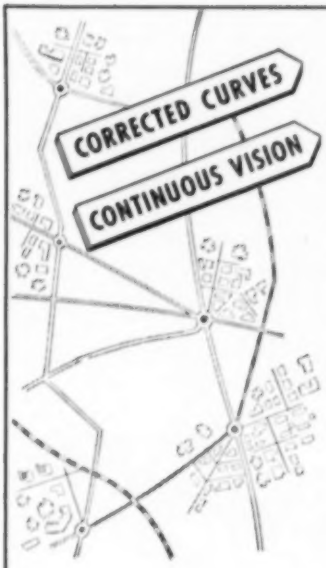

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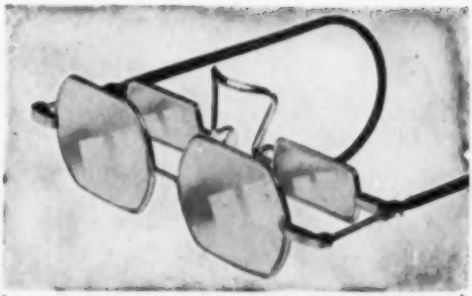

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Dusk Grey and White
Blue Grain and White

SIZE DATA

Temples No. 53 and No. 59		No. 56	Eyes	Bridges
5¼" L.O.	4 " L.B.	5½"	42	18, 20, 22, 24
5½" L.O.	4¼" L.B.	5¾"	44	18, 20, 22, 24, 26
5¾" L.O.	4½" L.B.	6 "	46	18, 20, 22, 24, 26
6 " L.O.	4¾" L.B.	6¼"	48	18, 20, 22, 24, 26
6¼" L.O.	5 " L.B.	6½"		
6½" L.O.	5¼" L.B.	6¾"		
		7 "		

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